No. 2291

United States

Circuit Court of Appeals

For the Ninth Circuit.

DETROIT COPPER MINING COMPANY OF ARIZONA, a Corporation,

Appellant,

vs.

THE MINE AND SMELTER SUPPLY COMPANY, a Corporation,

Appellee,

And

ARIZONA COPPER COMPANY, a Corporation,

Appellant,

vs.

THE MINE AND SMELTER SUPPLY COMPANY, a Corporation,

Appellee.

Supplemental Transcript of Record.

[Defendant's Original Exhibits "A," "B," "C," "D," "E," "F," "G," "H," and "I."]

Upon Appeal from the United States District Court for the District of Arizona.

[Defendant's Exhibit "A"—Drawings and Specifications of Letters Patent No. 513,849, to G. W. Waitt, Patented January 30, 1894.]

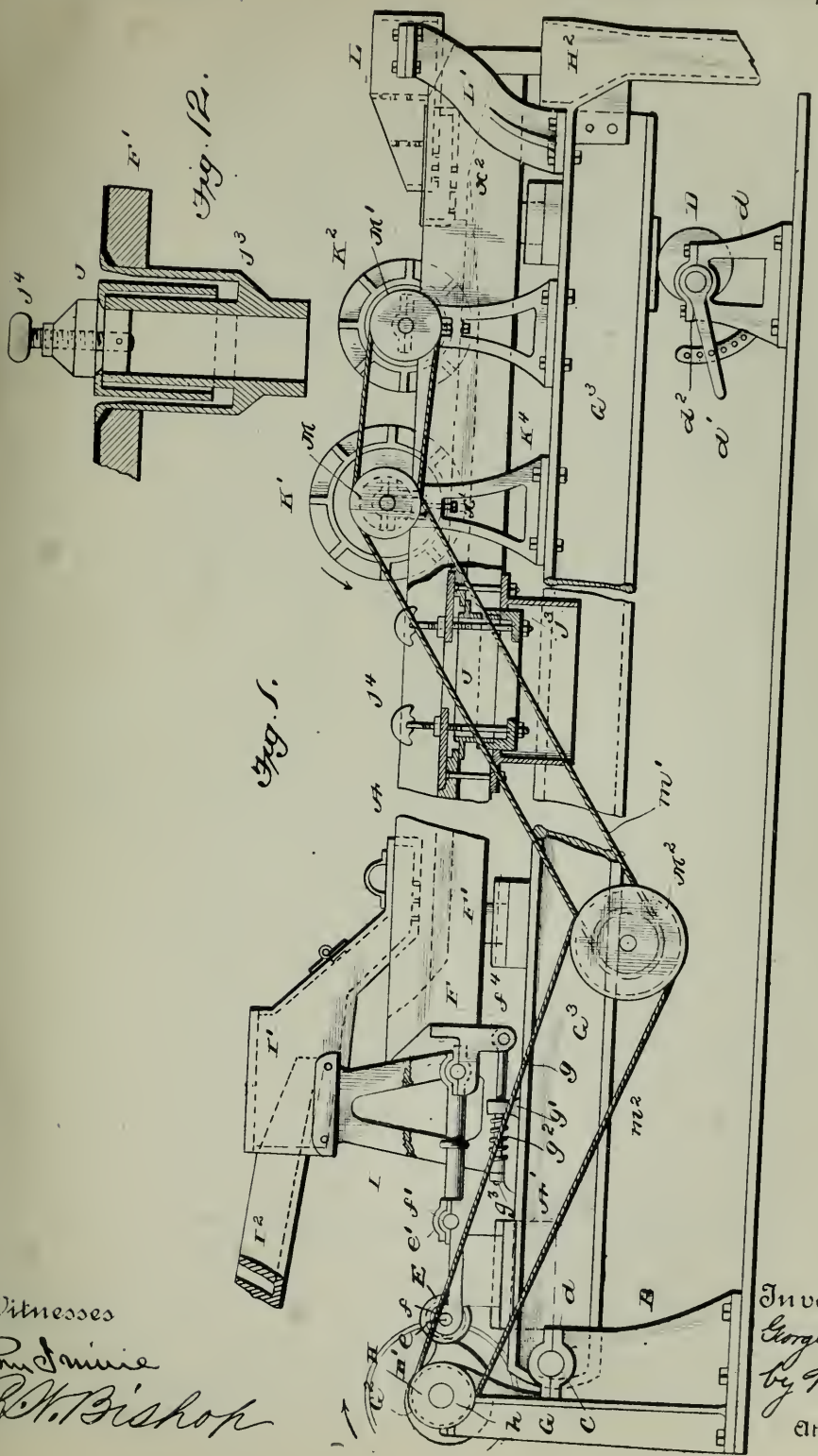
[Endorsed]: Mine & Smelter Supply Co. vs. Arizona Copper Co. Defendant's Exhibit "A." Patent to G. W. Waitt, #513,849. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "A." Received Aug. 20, 1913. F. D. Monckton, Clerk.

G. W. WAITT.

ORE CONCENTRATOR.

No. 513,849. Patented Jan. 30, 1894.



Witnesses

John Jaimie

R. W. Bishop

Inventor

George W. Waitt

by Wallace

Attorney

(No Model.) 4 Sheets—Sheet 2.

G. W. WAITT.

ORE CONCENTRATOR.

No. 513,849. Patented Jan. 30, 1894.

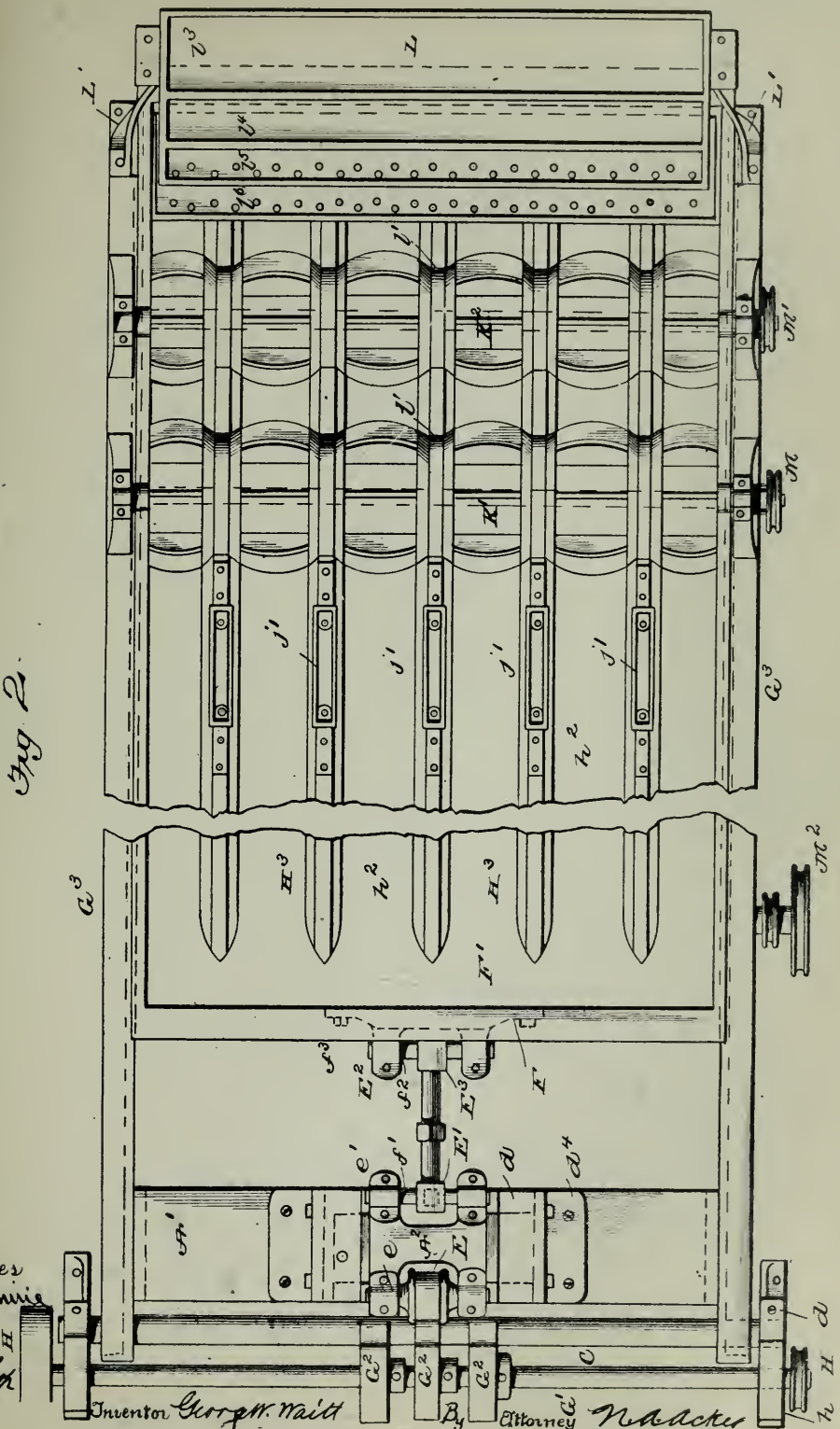


Fig. 2.

Witnesses
John Imrie
R. K. Bishop

Inventor Geo. W. Waitt
By Attorney Wadacker

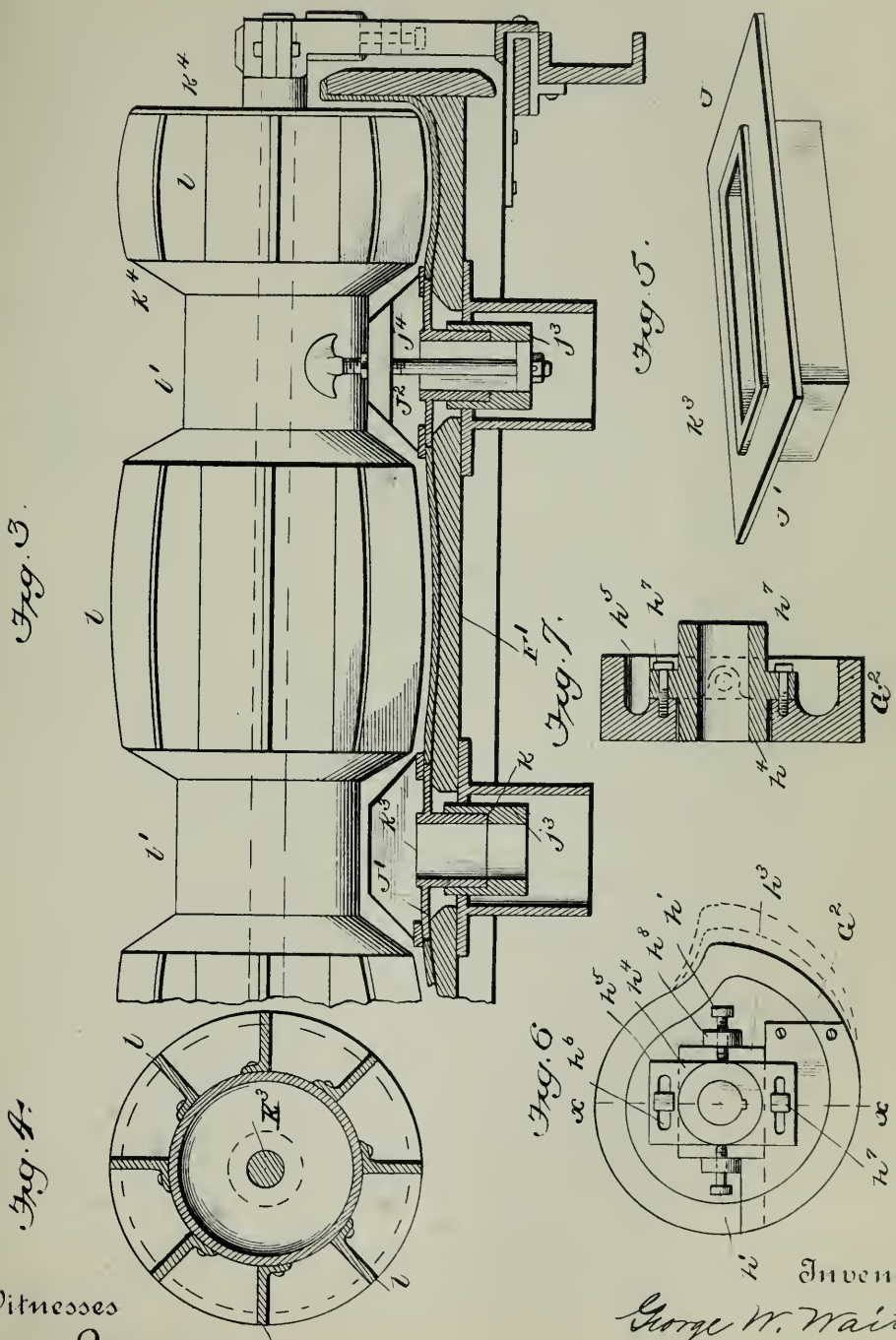
(No Model.)

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G. W. WAITT.

ORE CONCENTRATOR.

No. 513,849. Patented Jan. 30, 1894.



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4 Sheets—Sheet 4.

G. W. WAITT.

ORE CONCENTRATOR.

No. 513,849. Patented Jan. 30, 1894.

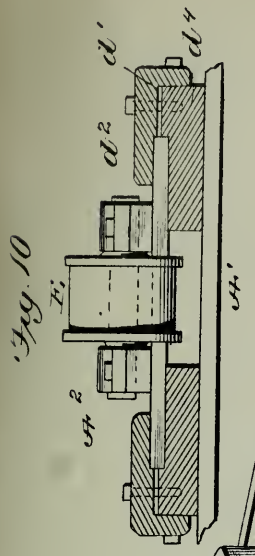


Fig. 10.

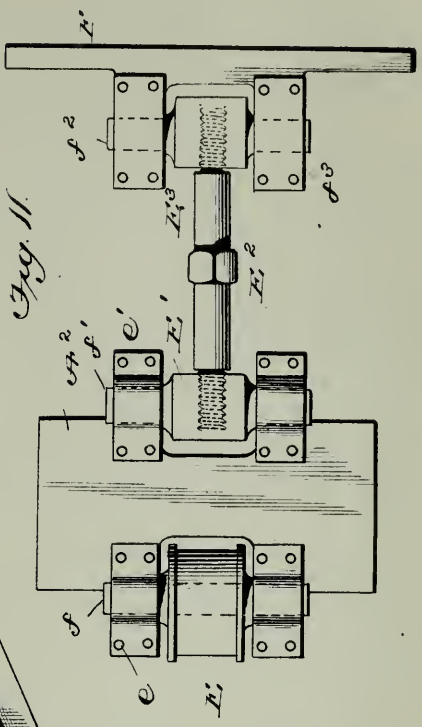


Fig. 11.

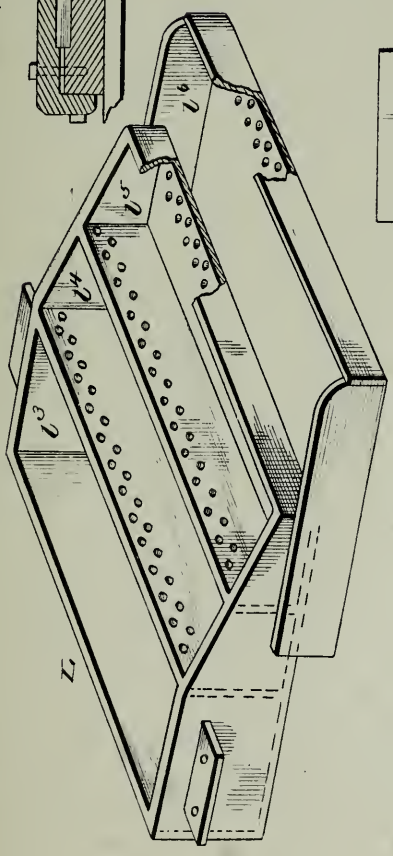


Fig. 8.

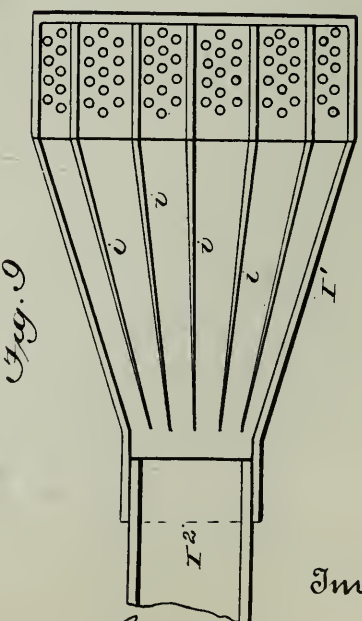


Fig. 9.

Witnesses

John W. Louise

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Inventor

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UNITED STATES PATENT OFFICE.

GEORGE W. WAITT, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO FOSTER S. DENNIS, OF KINGMAN, ARIZONA.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 513,849, dated January 30, 1894.

Application filed May 25, 1893. Serial No. 475,515. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. WAITT, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Ore-Concentrators; and I do hereby declare the following to be a full, clear, and exact description of said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

My invention relates to certain new and useful improvements in ore concentrators, and it consists of the arrangement of parts and details of construction as will be hereinafter more fully set forth in the drawings, described and pointed out in the specification.

The object of my invention is to provide a concentrator which shall provide for the more perfect separation of the sulphurets from the sand and base material, and at the same time allow for the overflow of the gangue from the concentrating table.

Referring to the drawings forming a part of this application, in which similar letters of reference are used to denote corresponding parts throughout the entire specification, Figure 1 is a longitudinal sectional view of the entire machine. Fig. 2 is a top plan view thereof with pulp feeder removed. Fig. 3 is a detail view of the conveyers mounted above the concentrating bed. Fig. 4 is a similar view in cross section. Fig. 5 is a detail view showing one of the overflow tailing discharges or hoppers. Fig. 6 is a detail view of the adjustable operating cam, the dotted lines indicating the several cams having different contours; Fig. 7 a vertical sectional view of the cam taken on line x—x of Fig. 6; Fig. 8 a top plan view of the water distributer; Fig. 9 a similar view of the pulp feeder and distributer; Fig. 10 a detail view of the cam actuated roller; Fig. 11 an enlarged top plan of the movable frame for the cam actuated roller showing connecting rod attachment to the concentrator bed or table; Fig. 12 a modification of the overflow tailing discharge shown in Fig. 5.

The letter A indicates the concentrator proper, the frame of which is movably secured between the standards B, by means of the rod C, which is secured within bearings a, formed in said standards. The discharge end of said concentrator rests upon the cams D, one located under each of the side beams, which work within bearings formed in the standards d. By means of the handle d' and segment d^2, I am enabled to raise or lower said cam, and inasmuch as the longitudinal beams of the concentrator frame rest thereon necessarily raise or lower the same, which carrying therewith the concentrating bed regulates the inclination thereof. Upon the head cross beam A′, I secure the blocks a^1, and upon said blocks I secure the caps a', so as to form the longitudinal groove a^2, within which the operating frame A^2 slides, as more fully shown in Fig. 10. Within bearings e, e', I secure the short rods f, f', upon the former of which I mount the cam actuated roller E, while on the latter I locate the nut E′. Within said nut works one end of the connecting rod E^2, the other end of which works within the nut E^3, secured to the rod f^2, which is mounted in bearings f^3, formed in the outwardly extending portion of the plate F, which is secured to the concentrator bed F′. Said plate is provided with the downwardly extending tail piece f^4 which has connected thereto the spring actuated rod g. This rod extends through the opening formed in the standard g', which is secured to the side beam G^3, of the concentrator frame. Around said rod, to the outer side of the standard g', I place the spiral spring g^2, which is held securely thereon by reason of the nut g^3. Any number of spring actuated rods may be employed for the purpose of giving backward force to the concentrating bed, as hereinafter more fully set forth.

To the front of the machine I locate the standards G, and secure within bearings h, formed in the top thereof, the driving shaft G′, upon which I locate the single scroll cams G^2, preferably three in number, which are held in their adjusted position by means of the set screws h'. Said cams have the central rectangular opening, h^3, formed therein, which permits of the same fitting upon the rectangular blocks h^4, which are secured or feathered to the driving shaft G′. These blocks are provided with the flanged portion

h^5, which have the elongated slots, h^6, formed therein. Through these slots work the bolts h^7, which secure the cams. By means of the set-screws, h', working through the lip, h^8, and in block, h^4, I am enabled to move the cams forward or backward so as to increase or decrease the throw of the concentrating table. One quarter of the cam is made removable in order to permit the securing thereof upon the sliding blocks of the driving shaft. However, if so desired, all of the cams may be secured by means of long bolts passing therethrough. The blocks are all connected to the shaft, G', by spline and feather arrangement, as shown in Fig. 6, and the cams are secured in their adjusted position upon said blocks, by means of the set-screws h'. Only one cam of the series, of course, engages the cam-actuated roller E, and if it is desired, for the reason hereinafter stated, to change the cams so that a different one of the series may engage said cam-actuated roller, all that is necessary to be done is simply to loosen the set-screws, h', of the engaging cam, and then move the same and its block longitudinally on the feather until a point is reached where it is out of contact. The set-screws of said cam are then tightened, and the cam designed to next engage the roller is free to be moved to a position of contact, by simply loosening its set-screws h'. After the proper adjustment of this last-named cam is secured, the set-screws are then again tightened. To the outer end of the driving shaft the pulley H may be secured by means of which power is communicated to said driving shaft, while at the same or opposite end the driving pulley wheel H', is fastened. The single scroll cams vary in their contour so as to impart a stronger or lighter throw of the concentrating bed, as hereinafter more fully set forth and described.

The concentrating bed or table is indicated by the letter F', as before stated, which is level for a portion of its length, up to about the point x', (about two-thirds of its length) when it gradually incline. to the point x^2, from whence it gradually inclines so as to make its discharge into receptacle H^2. The concentrating bed or table is made movable upon the concentrator frame, and is operated in the hereinafter described manner.

To the beams G^3, of the concentrator frame, I secure the standards I, and between said standards I locate the pulp distributer I', which is divided into distributing ways i, which correspond with the traveling ways formed in the concentrating bed, and are designed to make their discharge into said ways h^2, the surface of which I form slightly concaved between the longitudinal ribs H^3. The lower or discharge end of said distributer is provided with a series of openings through which the pulp fed from the mill through the conveyer I^2, is discharged. However, if so desired, said openings may be dispensed with and the lower end of the distributer left open for such discharge. At suitable intervals I provide the openings j', in the concentrating bed, for the purpose of permitting the overflow water and gangue to pass from the concentrating bed. Within said openings I place the rectangular overflow hopper J, which is provided with the overlapping flange J'; said flange resting upon the shoulder formed by providing the opening j'.

The letter J^3 indicates a supplemental or supporting pipe, which is secured to the bed by means of the screws j^4. Within this supplemental pipe the overflow hopper J, is adapted to fit, the lower end of said hopper resting upon a shoulder, k, formed in said supplemental pipe. Said rectangular overflow hopper is provided with the upper flange k^3, which permits the settling therearound of any of the sulphurets which may be washed toward the openings with the overflow of the tailings or waste material. The rectangular overflow hopper by preference I construct of rubber, but any suitable material, such as iron or steel, may be employed for this purpose with equally good results, as shown in Fig. 12. By means of the thumb screws j^4, I am enabled to raise or lower said overflow hopper so as to more effectually provide against the overflow of valuable sulphurets with the sand and water.

The letters K', K^2, indicate the rotary conveyers, which serve the purpose of carrying downward and checking the upward movement or travel of the sand upon the inclined portion of the table, thereby mechanically assisting the movement of the sand without interference with the travel of the sulphurets, and at the same time obviating the necessity of giving greater inclination to the concentrating table, or of using increased flow of water in order to create separation of sand and sulphurets. Said conveyers are mounted within bearings formed in the standards K^4, and the same I secure upon the shaft K^3, which has provided thereon a series of collars k^4. Between said collars I secure the paddles l, and regulate the same so as to just revolve above the concentrating bed level of the sulphurets, on the inclined portion. The collars have their outer faces formed at an incline, and have the space i' therebetween, so as to allow for the longitudinal ribs fitting therebetween.

To the rear of the concentrating frame I locate the water distributer L, which is supported by means of the standards L'. Said distributer is divided into separate compartments l^3, l^4, l^5, l^6, each of which has a series of perforations formed therein, so as to permit communication therebetween, and passage of the water from one into the other until finally discharged upon the concentrating bed. It often happens in the feeding of water, that the openings in the distributer become clogged by reason of leaves or other foreign matter accumulating therein, but by providing the same with separate compart

ments uniting with one another, this defect is obviated and the leveling of the water in the compartments not prevented. The different compartments run in order of steps, as fully shown in Fig. 8. The point of discharge for the water is directly over the incline of the bed.

Upon the end of the pulp conveyers or shafts I secure the pulley wheels M, M′, which are connected to pulley M^2, by means of the cable m', and said pulley is connected to pulley H′, by means of cable m^2. As said pulley derives motion from driving shaft G′, the same is transmitted by reason of cable m^2, to pulley M^2, which in turn through the medium of cable m', imparts power to pulleys M, M′, which cause the rotation of the conveyers K′, K^2.

The operation of my machine is as follows:—With the rotation of the driving shaft G′, the single scroll cams revolve therewith. With such revolution one of the cams coming in contact with the roller E, mounted in sliding frame A^2, causes the latter to move forward in the slide groove a^2, which frame being connected to the concentrator bed through the medium of the connecting rod E^2, necessarily causes the same to move in the same direction. When the single scroll cam revolves sufficiently to give the concentrating table its greatest forward travel, the contour thereof allows of a quick, reverse motion to be imparted to said table for a portion of its travel, after which it gradually reduces to a slow motion until it completes its rear throw, the spring actuated rod g always holding the face of roller E in contact with the face of the cam, said rod g being secured to the downwardly extending tail-piece f^4 of the plate F′. As the pulp is discharged upon the bed of the table, it gradually moves forward toward the discharge end of the same by the motion imparted thereto, while the sulphurets of their own gravity, assisted by the motion of the bed, settle and naturally remain together thereon during their travel toward the discharge end of the concentrator. As the pulp reaches the overflow hopper, all sand and water above the adjustable edge thereof, will pass therethrough, while the sulphurets, carrying therewith a portion of the sand, will travel toward and up the inclined portion of the table, whereon the sand will be given a reverse or backward movement by the downwardly flowing current of water, assisted by the conveyer, so as to be finally discharged through the overflow hopper, which, as will be seen by the arrows, moves in an opposite direction to the bed of the table and thus will be separated from the sulphurets. However, the sulphurets, having greater specific gravity, will adhere to the bed of the table, and be carried up the inclined portion until finally discharged into the mineral or sulphurets receptacle. It will thus be observed that the pulp, including sand and sulphurets, travels in the same direction until the incline is reached, when they become separated and travel in opposite directions, the sand, as above stated, being carried by the action of the water and conveyer, toward the overflow hopper J. By providing the driving shaft G′, with an adjustable throw, I am enabled to give to the table or concentrating bed a longer or shorter throw; while by securing a series of cams on the shaft, each having different contour, I am enabled to impart to the table a quick or slow return, or in other words, a stronger or lighter jerk, thereby adapting the motion of the bed to various classes of ores.

I am aware that minor changes may be made in the arrangement of parts and details of construction herein shown and described without creating or necessitating a departure from the nature and scope of my invention.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with an ore concentrator, of the concentrating table, and of the rotary conveyers located above the concentrating bed and adapted to prevent the upward travel of the sand with the sulphurets, said conveyers being rotated through the medium of suitable mechanism, substantially as set forth and described.

2. In an ore concentrator, the combination of an adjustable supporting frame, standards at one end of said frame a driving shaft mounted in bearings at the upper end of said standards, a cam upon said shaft a sliding frame adapted to be actuated by the cam, a concentrating table or bed, a plate secured thereto, said plate provided with a downwardly-extending tail-piece, a rod for connecting the sliding frame with the plate, and a spring-actuated rod connected to the tail piece of said plate for imparting a reverse or backward movement to the concentrating bed, substantially as set forth.

3. In an ore concentrator, the combination of a supporting frame, standards at one end thereof, a driving shaft mounted in bearings at the upper ends of said standards, a series of cams splined to the shaft, said cams being of different contours, and a sliding frame adapted to be interchangeably engaged by said cams so as to have a variable motion imparted thereto, substantially as set forth.

4. In an ore concentrator, the combination of a supporting frame standards at one end thereof, a driving shaft mounted in bearings at the upper ends of said standards, cams upon said shaft, a sliding frame, a roller mounted in the rear end of said frame and adapted to be engaged by the cams, a concentrating table or bed connected to said sliding frame, and a spring-actuated rod for giving a reverse or backward movement to said concentrating table, substantially as set forth.

5. In an ore concentrator, the combination of a supporting frame provided with an upwardly extending standard, a movable con-

centrating table or bed, a plate secured to the end thereof provided with a downwardly extending tail piece, a rod passing through the standards of the supporting frame and having one end connected to the tail piece, a nut upon the opposite end of said rod, and a spring interposed between the standard and the nut, substantially as set forth.

6. In an ore concentrator, the combination of a supporting frame, standards at one end thereof, a driving shaft mounted in bearings at the upper ends of said standards, a series of cams upon said shaft, a sliding frame, a short shaft mounted in bearings in the rear end of the frame, a similar shaft mounted in the forward end of the sliding frame, said shaft carrying a nut, a concentrating table or bed, a plate secured thereto, a shaft journaled in bearings in the outwardly-extending portion of said plate, said shaft carrying a nut, a connecting rod having one end working in the nut of the sliding frame, and its opposite end working in the nut of the plate, and the spring-actuated rod for giving to the concentrating table or bed a reverse or backward movement, substantially as set forth.

7. In an ore concentrator, the combination of a supporting frame, standards at one end thereof, a driving shaft mounted in bearings at the upper ends of said standards, cams upon said shaft an end cross beam upon the supporting frame, blocks secured to said cross beam, caps secured to the blocks said blocks and caps provided with registering cut-away portions to form ways, and a sliding frame working in said ways, adapted to be actuated by the cam, substantially as set forth.

8. In an ore concentrator, the combination of a concentrating table or bed provided with a series of openings, of hoppers extending through said openings, and vertically adjustable so as to bring their upper ends above the plane of the concentrating table, in order to prevent the escape of the mineral bearing lower stratum, substantially as set forth.

9. In an ore concentrator, the combination of a concentrating table or bed provided with a series of openings therein, rectangular hoppers placed within the openings and provided at their upper ends with outwardly and upwardly extending flanges, supplemental or supporting pipes provided with shoulders forming seats for the lower ends of the hoppers, and screws for adjusting the height of the hoppers, substantially as set forth.

10. In an ore concentrator, the combination with a movable concentrating table provided with a series of longitudinal ribs, of conveyers provided with a series of annular depressions registering with the longitudinal ribs of the table; said conveyers rotating in a direction opposite to the line of movement of the concentrating table, substantially as set forth.

11. In an ore concentrator, the combination with a movable concentrating table provided with a series of longituding ribs, the space between said ribs being slightly concave, of conveyers rotating in a direction opposite to the line of movement of the concentrating table, consisting of a series of collars, and paddles secured between said collars, the space between a set of the collars registering with the longitudinal ribs of the table, substantially as set forth.

12. In an ore concentrator the combination of a concentrating table or bed, conveyers located above said table or bed, adapted to move in a direction opposite to the line of movement of the concentrating table or bed, and a water distributer secured to the rear of the concentrating bed, said distributer consisting of a series of departments arranged one below the other, and having a series of perforations formed therein, substantially as set forth.

13. In an ore concentrator the combination with a movable concentrating frame, said frame inclined upwardly between two given points, and provided with a series of discharge hoppers, of conveyers arranged above the concentrating bed and rotating in a direction opposite to the line of movement of the concentrating frame, substantially as set forth.

14. In an ore concentrator, the combination of a movable concentrating frame, upwardly inclined between two given points, and downwardly inclined from one of said points to the discharge end of the bed, said frame also provided with a series of discharge hoppers, conveyers rotating in a direction opposite to the path of movement of the concentrating bed, and a water distributer located at the discharge end of the concentrating bed, substantially as set forth.

15. In an ore concentrator the combination with a movable concentrating table or bed, provided with a series of longitudinal ribs forming concave spaces, of a pulp distributer divided into a series of distributing ways registering with the spaces of the concentrating table, the lower or discharge end of said distributer being perforated, substantially as set forth.

16. In an ore concentrator the combination of a supporting frame, standards secured thereto, a driving shaft mounted in the upper end of said standards, a driving wheel secured on one end of said shaft, a pulley mounted upon a shaft in bearings beneath the supporting frame, endless belt connecting said pulleys, a concentrating bed or table, rotary conveyers mounted upon shafts above the concentrating bed, said shaft provided with belt pulleys, a belt connecting the pulley beneath the supporting frame with the pulley of the rear conveyer, and a belt connecting the conveyer pulleys, substantially as set forth.

17. The combination of a driving shaft, rectangular flanged blocks feathered upon said shaft, said flanges provided with elongated horizontal slots, cams fitting upon said blocks, and set screws working through the slots, substantially as set forth.

18. The combination of a driving shaft rect-

angular blocks feathered thereon, cams fitting upon the blocks, said cams provided with laterally projecting lips, and set screws working through said lips, so as to bear upon the blocks, substantially as set forth.

19. The combination of a driving shaft, rectangular flanged blocks feathered thereon, said flanges provided with elongated horizontal slots, cams fitting upon said blocks, and provided with laterally extending lips, set screws working through the elongated slots of the blocks into the cams, and set screws working through the lips of the cams, and bearing upon the blocks, substantially as set forth and described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. WAITT.

Witnesses:
N. A. ACKER,
M. G. LOEFLER.

[Defendant's Exhibit "B"—Drawings and Specifications of Letters Patent No. 415,999, to G. Gates, Patented November 26, 1889.]

[Endorsed]: Mine & Smelter Supply Co. vs. Arizona Copper Co. Defendant's Exhibit "B." Patent to G. Gates, #415,999. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "B." Received Aug. 20, 1913. F. D. Monckton, Clerk.

(No Model.) 3 Sheets—Sheet 1. 320

G. GATES.

CONCENTRATOR.

No. 415,999. Patented Nov. 26, 1889.

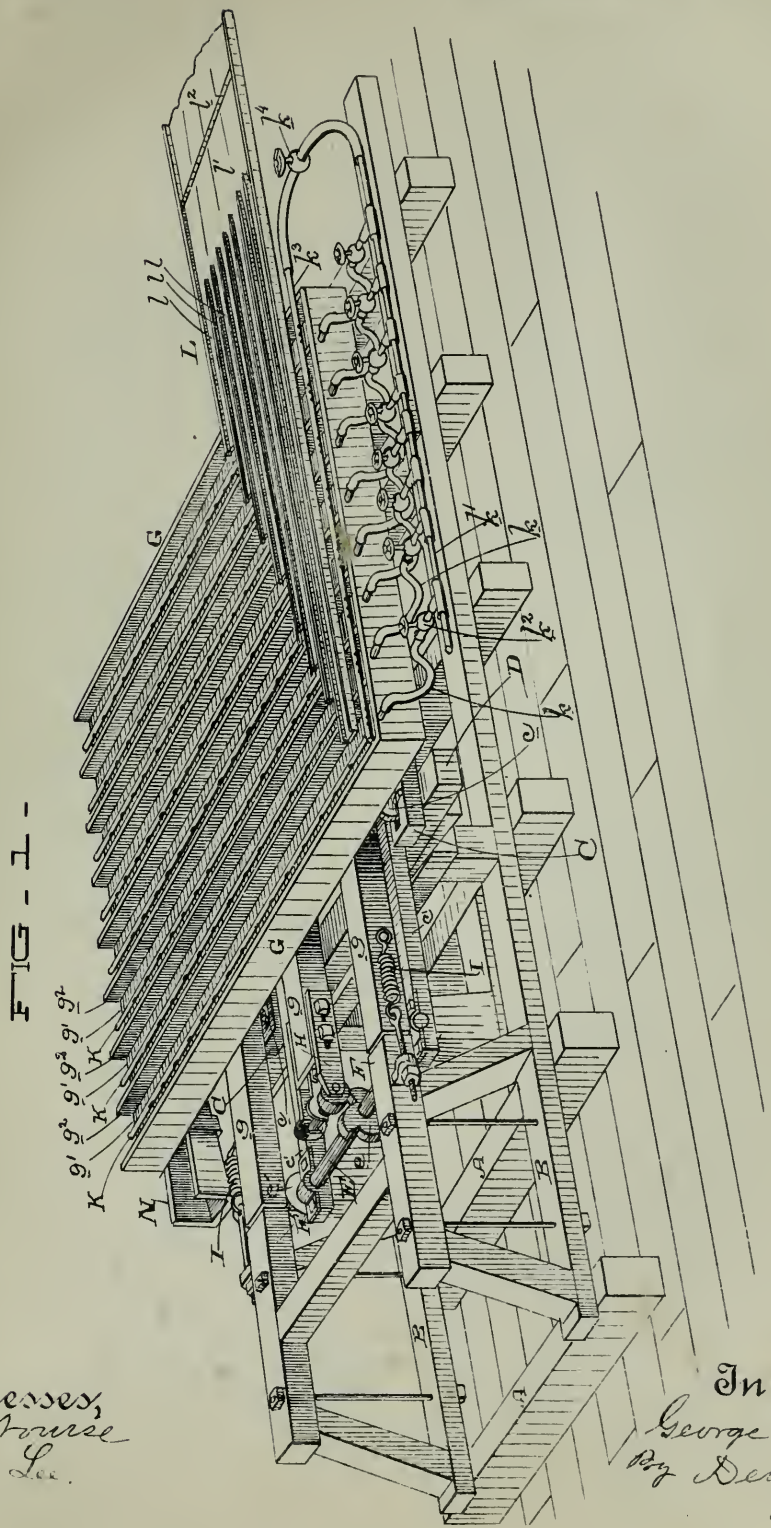


FIG. 1.

Witnesses,
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H. C. Lee.

Inventor,
George Gates
By Dewey & Co
Attys

(No Model.) 3 Sheets—Sheet 2. 321

G. GATES.

CONCENTRATOR.

No. 415,999. Patented Nov. 26, 1889.

FIG-2-

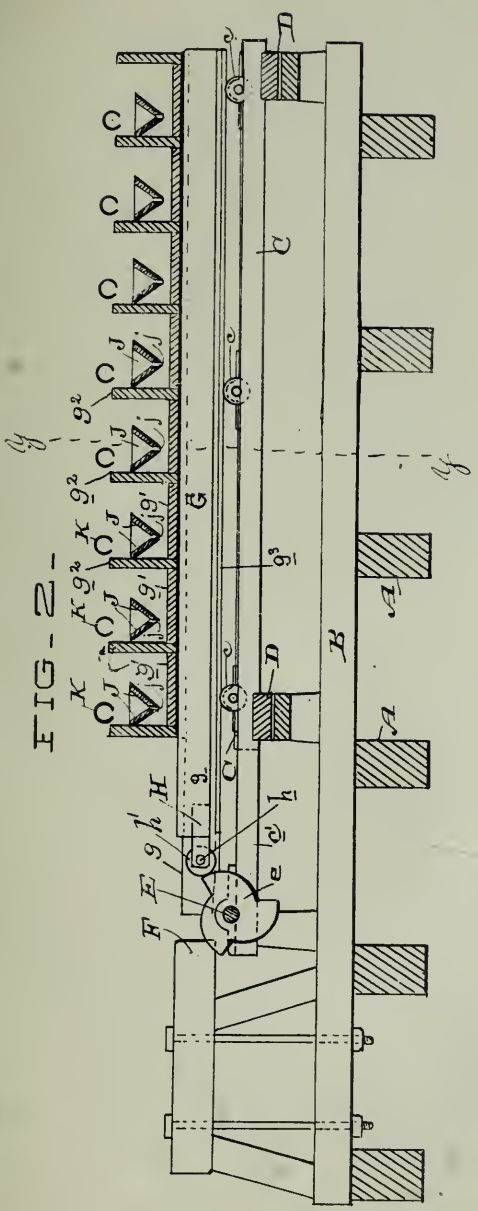
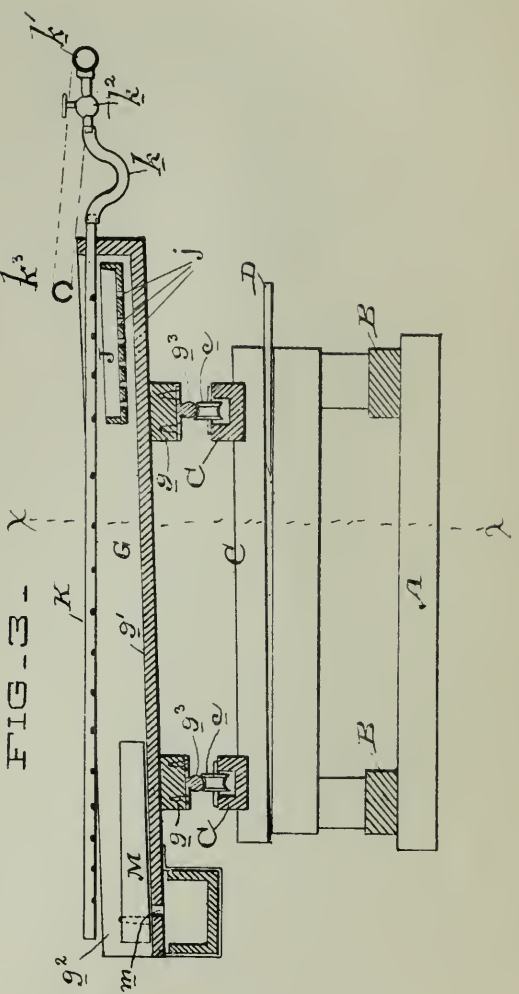


FIG-3-



Witnesses,
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H. C. Lee.

Inventor,
George Gates
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Attys

(No Model.) 3 Sheets—Sheet 3. 322

G. GATES.

CONCENTRATOR.

No. 415,999. Patented Nov. 26, 1889.

FIG. 5.

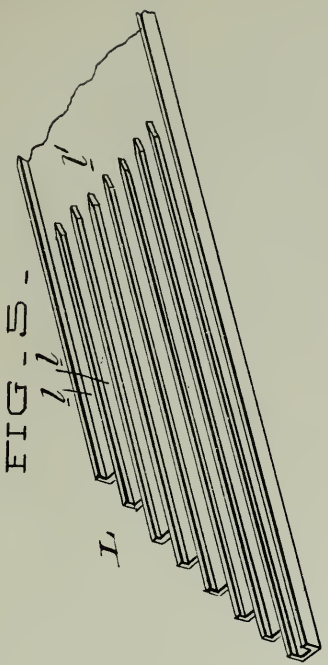


FIG. 6.

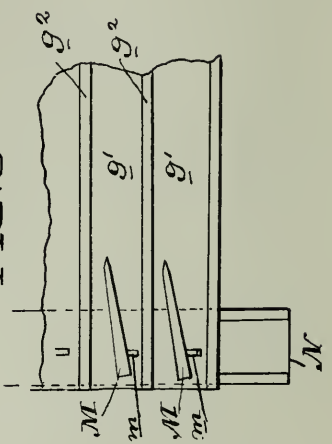
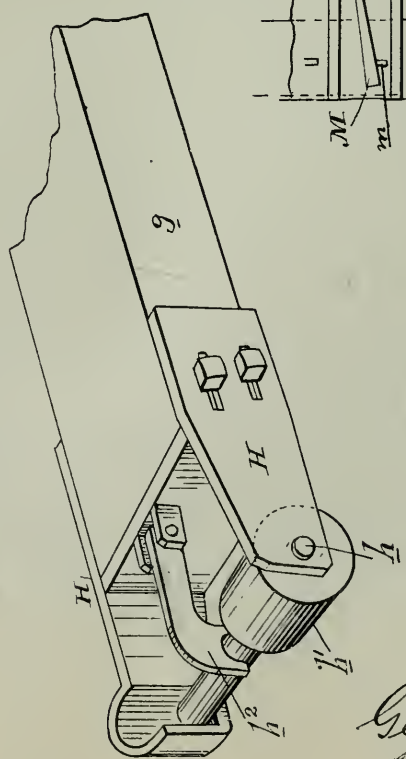


FIG. 4.



Witnesses,
P. Thurse.
H. C. Lee.

Inventor,
George Gates
By Dewey & Co
Attys

GEORGE GATES, OF DRYTOWN, CALIFORNIA.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 415,999, dated November 26, 1889.

Application filed July 1, 1889. Serial No. 316,253. (No model.)

To all whom it may concern:

Be it known that I, GEORGE GATES, of Drytown, Amador county, State of California, have invented an Improvement in Concentrators; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that class of machines for concentrating ores, in which the separation takes place upon a concentrating-table, to which is given a jarring movement; and my invention consists in the combinations and arrangement of parts, hereinafter fully described, and specifically pointed out in the claims.

The object of my invention is to provide a machine capable of effective and thorough concentration.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a perspective view of my concentrator. Fig. 2 is a vertical longitudinal section on the line x x of Fig. 3. Fig. 3 is a cross-section on the line y y, Fig. 2. Fig. 4 is a detail perspective of the roller h' and connections. Fig. 5 is a detail perspective of the feeder L. Fig. 6 is a plan of the foot of two of the runs g', showing the flanges M and discharge-slots m.

The frame-work or foundation of the machine is made up of the cross-pieces A, on the tops of which are secured the beams B, and on these beams is properly supported the adjusting-frame C, the lateral inclination of which may be varied to change the grade of the concentrating-table by means of the wedges D, adapted to be driven under it at one side. In the top of this adjusting-frame, on each side, are mounted the carrying-rollers c, and said frame is also provided with longitudinal strips c', the projecting ends of which serve as carriers for the cam-shaft E, upon which is mounted the cam e and a driving-pulley e'.

F are upright stationary buffer-frames mounted on the fixed foundation of the machine.

G represents the concentrating-table generally and is made up of longitudinal base-pieces g and a cross-platform which is divided into a number of parallel runs or channels g', formed by intervening raised strips g^2. The table G has tracks g^3, secured under its base-pieces g, and these tracks rest upon the grooved carrying-rollers c of the adjusting-frame. It will be seen that the concentrating-table G being mounted upon the frame C, as shown, its parallel runs or channels g' extend transversely of the machine, and the grade of these runs or channels may be adjusted and regulated by adjusting the inclination of the frame C by means of the wedges D, as heretofore mentioned. The two side beams g of the table serve as buffers to act against the buffer-frames F of the fixed foundation-frame, while the middle piece g has connected with its end a bracket H, having a cross-shaft h, on which is mounted a roller h', against which the cam e on the cam-shaft E is adapted to operate, whereby the entire table G is moved forwardly on the machine, traveling easily on the rollers c. The table is drawn back, so as to bring its pieces g into contact with the buffer-frames F to produce a jar, by means of the springs I, which are secured to the pieces g at one end and are adjustably connected with the buffer-frames F at the other end, whereby their tension may be properly regulated.

By rotating the cam-shaft E its cam e will act against the roller h' and thereby force the concentrating-table forward, and as it relieves said table the springs I will draw it backward, so that its pieces g come in contact with the buffer-frames and will produce a jar in a direction at right angles to the flow of material on the table. Within the runs or channels g', and at one side thereof, being the side next to the jarring mechanism, are fixed the boxes J, having a V shape, and commencing at the head of each run or channel and thence extending a short distance, in practice about eighteen inches. The boxes are provided with perforations j in their bottoms, so that the material fed to them is discharged at one side of the runs or channels.

K are perforated fresh-water pipes located in each run or channel g' and at one side thereof, being the same side on which the material is fed. These water-pipes extend the whole length of the runs or channels and are each connected at its head by pipes k.

with the main water-pipe k', the communication being regulated and controlled separately and independently by the cocks k^2. With the main pipe k' is also connected a supplementary perforated feed-water pipe k^3, which extends across the head of the table and across all the runs and is controlled by a cock k^4. It is adapted to discharge its water into the distributing-boxes J.

L is the feeder for the table. This consists of a number of parallel passages l, having regularly-increasing lengths, as shown, said passages communicating at their heads with the feed-chamber l', to which ore is fed over the apron l^2. This feeder is carried on the top of the table G at the head of its runs or channels, and the passages l of said feeder extend at right angles to the runs of the table, and by reason of their varying lengths there is one passage of the feeder for each run or channel of the table. The ends of the feeder-passage are in communication directly over the boxes J in the runs or channels of the table, so that the ore is fed directly into said boxes.

In order to throw the table out of connection with the cam-shaft, without stopping the movement of said shaft, I make the roller h' movable on its shaft h, so that it can be thrown over to one side out of the way of the cam e, whereby said cam may revolve freely without touching it; but when in position to be acted upon by the cam said roller is held by the swinging latch-arm h^2.

In the lower end of each run or channel g' is a slightly-inclined guide-strip M, on one side of which is a slot or opening m through the floor of the run or channel and communicating with the discharge-trough N.

The operation of the concentrator is as follows: The material is fed down from the battery of the stamp-mill over the apron l^2 into the feed-chamber l', from which it passes, and is distributed equally into each of the passages l of the feeder L. Thence it is discharged from the said passages into the boxes J in each of the runs or channels of the concentrating-table. In these boxes the material is again distributed equally through the perforations j, and, together with the water which is fed from the upper ends of the fresh-water pipes K, passes down into the runs or channels and wholly upon one side thereof, this side being the side next to the jar which the table receives. The water from the pipes K, falling also directly into the runs or channels below the boxes and upon the same or jar side of the channels, produces a transverse wave in the said channels, which, on account of the initial position of the material and the jar which the table receives, carries the sand and light worthless material off to the other side of each run or channel, leaving the concentrates upon the first side, so that in each run or channel there are two distinct streams of material, the one on the jar side being the concentrates, which confine themselves to that side, while the other is the worthless material, which is thrown to and remains on the other side. These two streams of material are by this construction kept very distinct from each other, and at the foot of each run or channel they are guided by the strip M, the concentrates passing into the slot m, from which they pass into the discharge-trough N, and the worthless material passes off the end of the run or channel.

The object of the supplementary water-pipe k^3 is to supply additional water to the material when required.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a concentrator, a table having its surface divided into a number of independent inclined runs or channels, said table being adapted to have a jarring or shaking movement at right angles to the flow of the material thereon, in combination with the feeder at one side of the head of the table extending at right angles thereto, and having independent passages communicating with the channels in the table for feeding one thereto, and a water-pipe for directing the water upon said side of the table, substantially as described.

2. In a concentrator, the combination of the table having its surface divided into a number of independent inclined parallel runs or channels and having a jarring or shaking movement at right angles to the flow of material therein, a feeder at right angles to the table having passages of regularly-increasing lengths, whereby the material is directed into the runs or channels in the table, and the perforated water-pipes on the same side of said runs or channels for discharging water into them on said side, substantially as described.

3. In a concentrator, the combination of the table divided into a number of independent parallel inclined runs or channels and having a jarring or shaking movement at right angles to the flow of the material therein, a perforated distributing-box in the head of each run or channel and at one side thereof, perforated water-pipes in the same side of the runs or channels, and a feeder having independent passages for directing the material into each of the distributing-boxes, substantially as described.

4. In a concentrator, the combination of the table formed with inclined runs or channels and having a jarring or shaking movement at right angles to the flow of the material therein, the perforated distributing-box at the head of each run or channel and at one side thereof, the perforated water-pipes extending the length of said runs or channels and at the same side thereof as the distributing-boxes, the directing-strips M at the base of each run or channel, the discharge-slots m and trough N, substantially as described.

5. In a concentrator, the table formed with he independent inclined runs or channels nd having a jarring or shaking movement t right angles to the flow of material therein, n combination with the distributing-boxes at he head of each run or channel and at one ide thereof, the perforated water-pipes ex-ending the whole length of said runs or hannels and at the same side thereof as he distributing-boxes, the main water-pipe, he connecting-pipes k, and the controlling-ocks k^2, whereby the water supplied to the uns or channels is regulated and controlled, ubstantially as described.

6. In a concentrator, the table formed with ne independent inclined runs or channels nd having a jarring or shaking movement t right angles to the flow of material therein, n combination with the distributing-boxes t the head of each run or channel and at ne side thereof, the perforated water-pipes xtending the length of each run or channel nd at the same side thereof as the distrib-ting-boxes, the main pipe k', the connect-ng-pipes k, and controlling-cocks k^2, and the upplemental water-pipe k^3, having the con-rolling-cock k^4, substantially as described.

7. In a concentrator, the table G, having ne inclined runs or channels, the perforated istributing-box at the head of each run or hannel at right angles and at one side there-f, and the perforated water-pipes at the same de of said runs or channels, in combination ith the sliding roller h', connected with the able, the shaft E, having the cam e operating gainst the roller, the buffers g of the table, ne fixed buffers F, and the springs I, con-ecting said buffers, substantially as de-cribed.

8. In a concentrator, the fixed frame-work rming the foundation, and the adjusting-ame C, mounted thereon and having carry-g-rollers c, in combination with the table , mounted upon said rollers, the parallel uns or channels formed on said table and xtending transversely to the direction of the table's movement, the perforated distribut-ing-boxes J in the head of each run or chan-nel and at one side thereof, the perforated water-pipes K in each run or channel and at the same side thereof, the shaft E on the frame C and the cam on the shaft, the roller on the table G, against which the cam acts, the buffers g of the table, the fixed buffers F of the foundation-frame, and the springs I, connecting the buffers, substantially as de-scribed.

9. In a concentrator, the movable table G and the cam e, operating against it, in com-bination with the sliding roller h, connected with the table and against which the cam acts, and the latch h^2, for holding the roller in place and relieving it, so that it may be thrown out of or into connection with the cam, substantially as described.

10. A concentrating-machine consisting of the combination of the foundation-frame hav-ing the fixed buffers F, the adjusting-frame C, mounted on the fixed frame, and the wedges D, for regulating the inclination of the frame C, the carrying-rollers c on said adjusting-frame, the cam-shaft E, carried by said frame and having the cam e, the table G, mounted on the carrying-rollers of the adjusting-frame and having the buffers g and the roller h', the springs I, connecting the buffers g with the buffers F, the parallel transversely-ar-ranged inclined runs or channels of the table, the distributing-boxes J at the head of each run and at one side thereof, the perforated water-pipes K in each run and at the same side thereof as the distributing-boxes, and the feeder L, mounted on the table at its head and having the passages l for directing the material into the distributing-boxes J, sub-stantially as herein described.

In witness whereof I have hereunto set my hand.

GEORGE GATES.

Witnesses:
S. H. NOURSE,
H. C. LEE.

[Defendant's Exhibit "C"—Drawings and Specifications of Letters Patent No. 149,622, to J. B. Wilder, Patented April 14, 1874.]

[Endorsed]: Mine & Smelter Supply Co. vs. Arizona Copper Co. Defendant's Exhibit "C." Patent to J. B. Wilder, #149,622. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "C." Received Aug. 20, 1913. F. D. Monckton, Clerk.

J. B. WILDER.

Ore-Concentrators and Washers.

No. 149,622. Patented April 14, 1874.

Fig. 1.

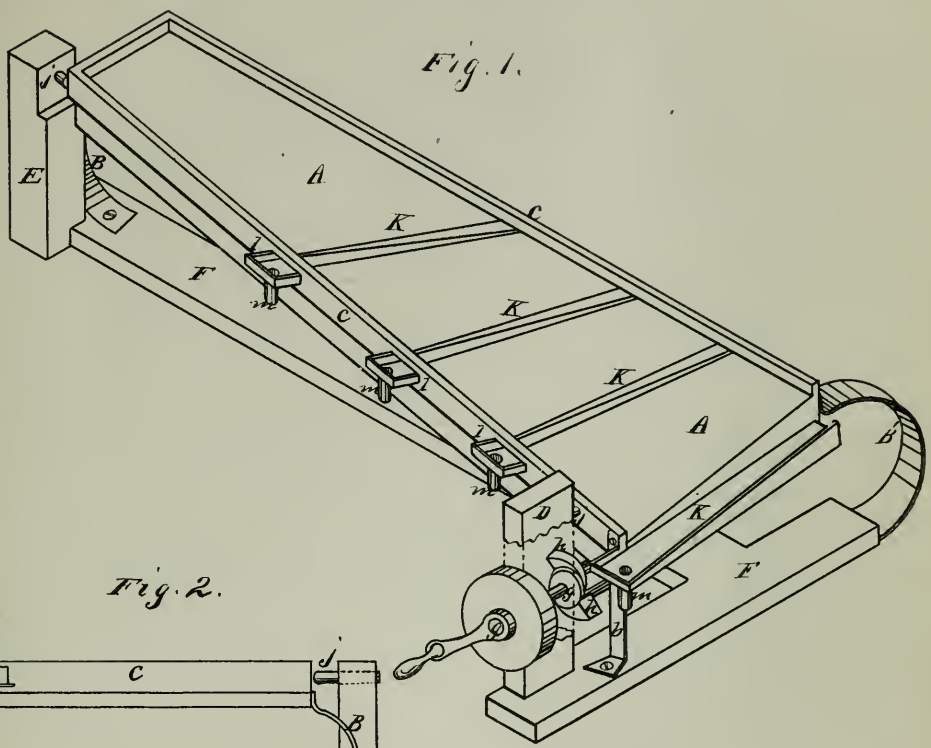
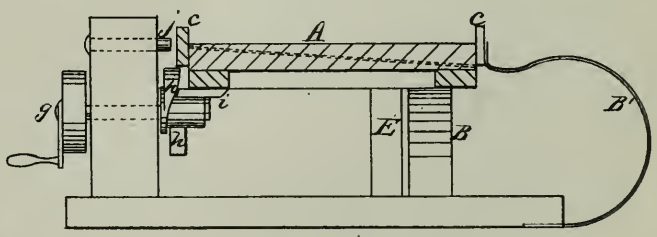
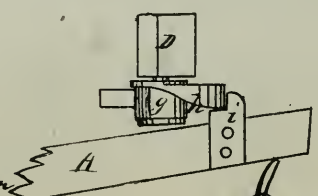


Fig. 2.

Fig. 3.





Witnesses
John L Borne
C. Milton Richardson

Jonas B. Wilder
by Dewey & Co
Attys

UNITED STATES PATENT OFFICE. 328

JONAS BROOKS WILDER, OF SONORA, CALIFORNIA.

IMPROVEMENT IN ORE CONCENTRATORS AND WASHERS.

Specification forming part of Letters Patent No. **149,622**, dated April 14, 1874; application filed December 23, 1873.

To all whom it may concern:

Be it known that I, J. B. WILDER, of Sonora, Tuolumne county, State of California, have invented an Improved Concentrator; and I do hereby declare the following description and accompanying drawings are sufficient to enable any person skilled in the art or science to which it most nearly appertains to make and use my said invention or improvement without further invention or experiment.

My invention relates to an improved table or sluice section for concentrating the heavy portions of pulp or pulverized ore by the wet process.

My improvement consists in mounting the table or sluice section upon springs, and then imparting to it a forward and side motion by a cam, so that when it is released from the cam the springs will force it back against two abutments, by which a compound jar will result. These abutments are so arranged that the direction of the combined concussion will be in a line diagonally across both the face of the table and the course of the moving pulp, so that the sulphurets and heavy particles of metal will be forced in a line with the line of concussion, while the lighter portions are carried off by the water.

In order to more fully illustrate and explain my invention, reference is had to the drawings accompanying this specification, in which—

Figure 1 is a perspective view of my invention. Fig. 2 is a side view near one end. Fig. 3 is an end view.

A represents a table or sluice section, which is mounted upon the C-springs B B′. One of these springs, B′, supports the rear end of the table, while the other, B, supports one corner of the forward end, as shown. An ordinary spring-leg, *b*, supports the opposite forward corner. The table has side boards *c*, in the manner of constructing an ordinary sluice. A post, D, is secured to the base or foundation timber E on the side of the table opposite the spring B′, while another post, F, is secured at its rear end. A shaft, *g*, passes through the post D, and carries, at its inner end, and directly below the table, a double cam, *h*. The arms of this cam are made bevel-ing on the inside, so that when they are revolved so as to strike the tappet *i*, on the under side of the table, it will give both a forward and side motion to the table, the curved face of the cam forcing the table forward, while the side bevel forces it to one side. Abutting points *j j* are secured to the posts E D, so that when the table is released from the cam the springs will drive it back against them simultaneously, and thus give a compound jar or thump to the table. As will be readily seen, the concussion produced by this compound jar will be in a line diagonal to the length of the table, the angle of concussion becoming greater toward the rear end of the table. Across the face of the table I make two or more inclined channels, K K, the shallow portion being at the discharge side of the table. An opening through the side of the trough, at the lower end of each channel, permits the water and lighter portions to escape, while a similar opening through the opposite side allows the sulphurets to pass out into a pan, *l*, from which they will be conveyed by a pipe, *m*, to any receptacle prepared for them. The concentrating-table can be set at any desired angle. The pulp is fed upon the upper end of the table, and flowing down it is arrested by the channels K K. The compound jar then causes the sulphurets and heavy portions of the pulp to travel up the channels into the discharging pan and spout, while the water will carry off the gangue and lighter portions through the opposite side.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

The concentrating table or sluice section A, provided with inclined diagonal grooves or channels K K, and mounted upon springs B B′ *b*, in combination with the double inclined cam *h* and abutments *j j*, substantially as and for the purpose above described.

In witness whereof I hereunto set my hand and seal.

JONAS BROOKS WILDER. [L. S.]

Witnesses:
EDWIN A. RODGERS,
H. B. MCNEIL.

[Defendant's Exhibit "D"—Drawings and Specifications of Letters Patent No. 528,503, to R. L. Chatterson, Patented October 30, 1894.]

[Endorsed]: Mine & Smelter Supply Co. vs. Arizona Copper Co. Defendant's Exhibit "D." Patent to R. L. Chatterson, #528,503. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "D." Received Aug. 20, 1913. F. D. Monckton, Clerk.

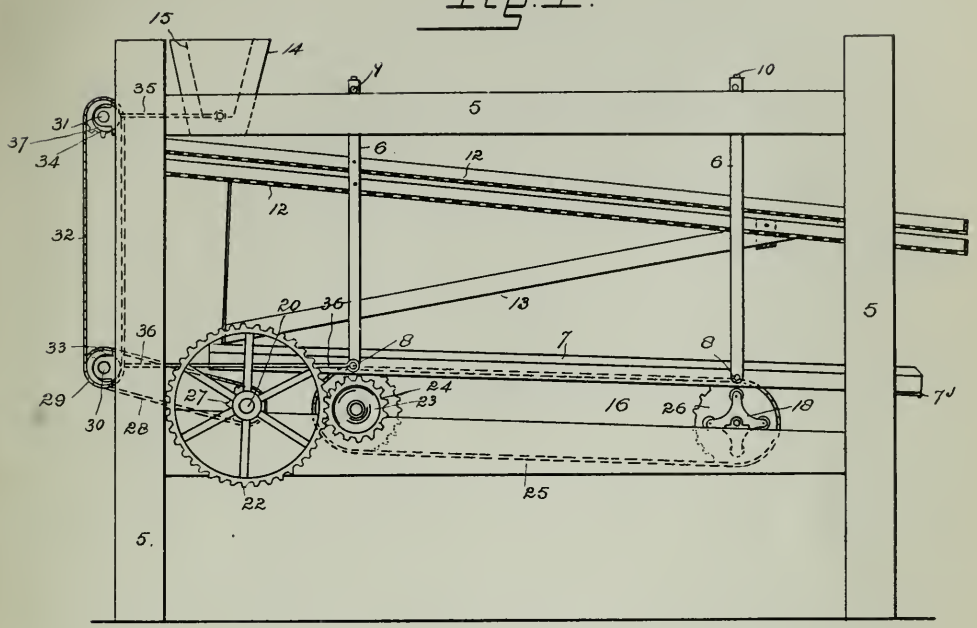
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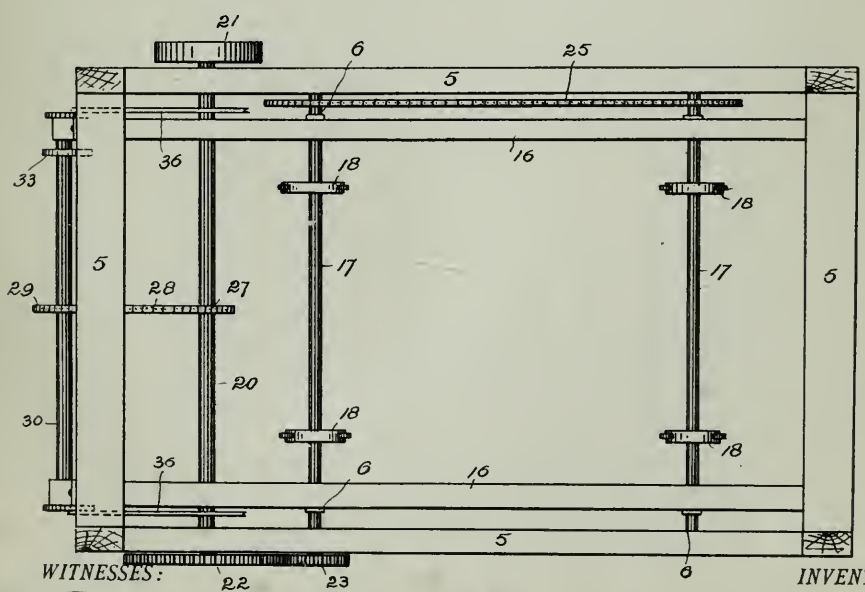
R. L. CHATTERSON.

PLACER MACHINE.

No. 528,503. Patented Oct. 30, 1894.

Fig. 1.





WITNESSES:

G. J. Dellamuit

Chas. E. Dawson

Fig. 2.

INVENTOR

R. L. CHATTERSON.

BY A. J. O'Brien

ATTORNEY

(No Model.) 2 Sheets—Sheet 2.

R. L. CHATTERSON.

PLACER MACHINE.

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Fig. 3.

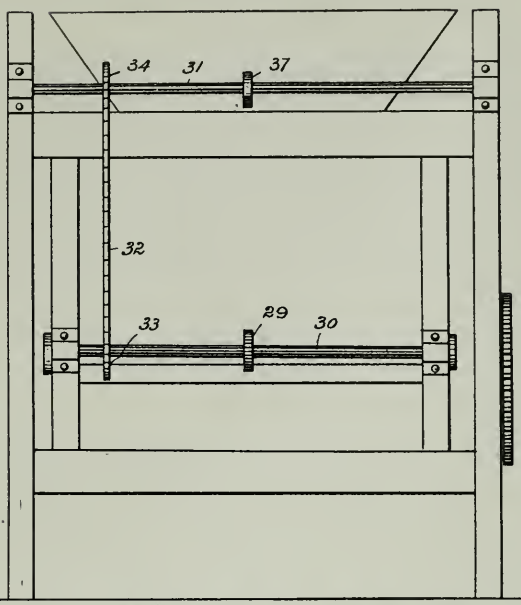
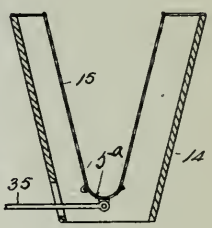


Fig. 6.



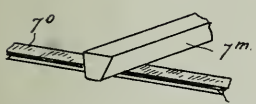


Fig 10.

Fig. 4.

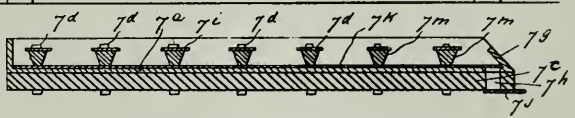
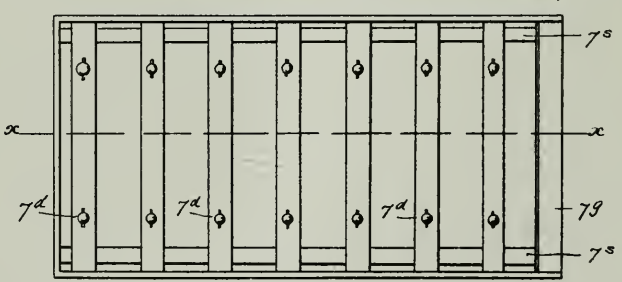


Fig. 5.



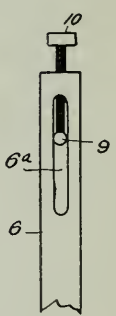


Fig. 7.

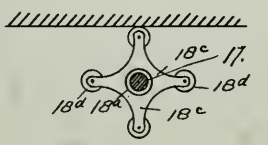


Fig. 8.

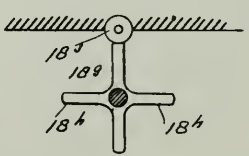


Fig. 9.

WITNESSES:

C. F. Dellaven

Chas. E. Dawson

INVENTOR

R. L. CHATTERSON.

BY

A. J. O'Brien

ATTORNEY

UNITED STATES PATENT OFFICE.

ROBERT L. CHATTERSON, OF DENVER, COLORADO.

PLACER-MACHINE.

SPECIFICATION forming part of Letters Patent No. 528,503, dated October 30, 1894.

Application filed May 25, 1894. Serial No. 512,401. (No model.)

To all whom it may concern:

Be it known that I, ROBERT L. CHATTERSON, a citizen of the Dominion of Canada, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Placer-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in machines for treating placer material; and is specially designed for handling adobe soil which is often richest in precious metals. This adobe material is very difficult to treat for the reason that the clay will not readily break up but remains in chunks called "gold thieves," since the gold adheres thereto and cannot be separated therefrom except by dissolving or thoroughly disintegrating and breaking up these clayey formations.

To this end, my improved machine is a combined concentrator and amalgamator.

I first concentrate by using burlap or suitable fibrous material on the bottom of the separating pan. This burlap allows the gold to hide in its meshes during the process of breaking up, separating and removing the adobe portion of the material. Below the burlap is the amalgamated copper bottom of the pan, which is protected by the burlap during concentration. Hence, when I am ready to amalgamate, I remove the burlap from the pan and replace the riffled frame, which then rests upon or engages the amalgamating plate.

My improved machine consists further of the features, arrangements and combinations hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawings in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a top or plan view of the same, with the pan, screens and trough removed to show the cam shafts and propelling mechanism. Fig. 3 is an end elevation of the machine. Fig. 4 is a vertical longitudinal section taken through the separating pan. Fig. 5 is a plan view of the same. Figs. 6, 7, 8, and 9 illustrate details of construction. Fig. 10 is a fragmentary view in perspective, illustrating the riffle-frame of the separating pan.

Similar reference characters indicating corresponding parts or elements of the mechanism in these views, let the numeral 5 designate the main framework of the machine composed of the vertical posts, and the longitudinal and transverse bars connecting the posts. Hung on this framework and supported by metal straps 6 attached to the longitudinal top bars, is an oscillating separating pan 7. The lower extremities of the straps 6 are pivoted to the pan as shown at 8. The upper extremities of the straps are provided with slots 6^a through which pass the horizontal suspension rods 9 made fast to the top bars of the frame. In the tops of the straps 6 are inserted the adjusting screws 10 which enter the slots and engage the rods. The straps, and consequently the separating pan, are raised and lowered by these screws. The ultimate function of these screws is to regulate the elevation of the pan with reference to the rotating cams engaging the pan underneath, and hereinafter described.

Above the pan 7, and also attached to the straps 6, are two parallel inclined screens 12 arranged one above the other, and an oppositely inclined trough 13 located under the screens. The function of this trough is to convey the screened material to the upper extremity of the pan. This trough is hinged at one extremity and supported by straps at the opposite extremity, the connection being such that it may be raised up out of the way while cleaning up. The screens are attached to the straps 6 and oscillate with the pan.

The screens 12 reject the bowlders and coarse rock portion of the gangue, and break up the adobe material fed thereto with the material from the hopper 14, in which is hinged a movable false hopper 15 composed of a screen-basket of such mesh as is best calculated to disintegrate and assist in the dissolution of the adobe portion of the material.

Underneath the pan 7, and journaled in beams 16 made fast to the framework, are two shafts 17 carrying the spider-shaped cams 18. These cams are composed of central web

portions 18^a (see Fig. 8,) from which, project arms 18^c carrying rollers 18^d. As the shafts 17 are rotated, the roller extremities of the cams engage the bottom of the pan 7, and impart thereto a vibratory movement in addition to the oscillating movement hereinafter described. The extent of the movement given by the cams is controlled and regulated by the screws 10 heretofore mentioned.

The separating pan 7 is composed of a wooden bottom 7^e, an amalgamated copper plate 7^a, a burlap covering 7^k for the plate, and a series of transverse riffles 7^m placed upon the burlap. The body portion of the riffles is composed of wood bars having inclined sides. These riffled bars are narrowest at the bottom, and gradually increase in size toward the top. To the upper surface of each riffle is attached a metal plate 7^l which is wider than the top of the riffle, and projects thereover on either side. The riffles are attached in any suitable manner to two metal strips 7^s upon which a strip of rubber 7^o is placed before the riffles are attached. This rubber engages the bottoms of the riffles. This riffled frame is secured to the separating pan in such a manner that it is readily detachable to permit the removal from or the attachment to the copper lining of the pan, of the burlap covering, in changing the machine from a concentrator to an amalgamator; and vice versa.

As shown in the drawings, the riffled frame is held in place by bolts which pass up through the bottom of the frame and through the riffles, being secured by thumb nuts 7^d applied to the upper extremities of the bolts.

The lower extremity of the pan is turned upward and bent inward as shown at 7^g. The lower end of the pan is provided with an outlet 7^h controlled by a slide 7^j. By moving this slide and opening the outlet, the concentrates may be drawn off into a suitable receptacle.

Power is applied to the machine by rotating a shaft 20 journaled in the beam 16 and provided with a fast pulley 21 which may be connected by a belt with any suitable motor. The opposite extremity of the shaft 20 is provided with a fast gear wheel 22, which meshes with another gear 23 fast on one of the cam shafts 17. To the extremity of the shaft opposite from the gear 23 is made fast a sprocket wheel 24 which is connected by means of a chain 25 with a sprocket 26 fast on the other cam shaft 17. To the shaft 20 is also attached a small sprocket wheel 27 connected by a chain 28 with another sprocket 29 on a shaft 30 journaled in the front end of the machine, or that shown at the left in Figs. 1 and 2.

The shaft 30 is connected with a shaft 31 located directly above, by means of a chain 32 engaging sprockets 33 and 44 on the respective shafts. The false hopper 15 is actuated from the shaft 31 by means of a pitman 35 leading from an eccentric 37 on the shaft. The oscillating movement is imparted to the separating pan from the shaft 30 by means of two pitmen 36 which are connected with two of the hangers 6.

In Fig. 9 I have shown a modified form of cam construction for imparting the vibratory movement to the pan 7. In this form, the cam, which I will designate as 18^s, is composed of arms 18^h made fast to a hub mounted on the shaft 17. The outer extremities of these arms engage a roller 18^j journaled in the bottom of the pan, thus securing a result similar to that obtained from the cam shown in Fig. 8.

From the foregoing description of the mechanism, its operation will be readily understood.

The material to be treated is fed into the hopper in any suitable manner. By applying power to the machine in the manner heretofore explained, a shaking movement is imparted to the false hopper which is hinged to the top of the stationary hopper. A suitable quantity of water is fed to the hopper simultaneously with the discharge thereinto of the material to be treated. This shaking movement of the false hopper has for its object, the breaking up and disintegration of the adobe material. From this hopper, the material passes to the screens 12, which further disintegrate the adobe material, and separate the coarser part of the rock and gangue. After passing through the screens, the material drops into the trough 13 and is carried thereby to the front end of the separating pan, in which it is subjected to the influence of the combined oscillating and vibratory movements imparted to the pan by the pitmen 36 and the cams 18. The concentrates collected in this pan are drawn off through the opening 7^h as heretofore described. When it is desired to amalgamate the concentrates thus collected, the thumb nuts 7^d are removed, the riffle frame lifted out of the pan, the burlap covering of the pan removed, and the copper plates charged with mercury. The riffle frame is then replaced and fastened, the concentrates placed in the pan, and the operation of the machine continued.

To facilitate the removal of bowlders or other coarse rocky material which will not pass through the meshes or apertures of the false hopper, I have provided this hopper with a hinged bottom 15^a which may be opened at intervals for the purpose of releasing such coarse rocky gangue as cannot otherwise escape. This hinged bottom may be controlled in any suitable manner from the outside of the hopper.

Having thus described my invention, what I claim is—

1. In a concentrator, the combination with the stationary frame, the movable pan, the supporting hangers movably attached to the pan, the rods passed through the upper part of the frame, the upper extremities of the hangers being vertically slotted to receive

the said rods, adjusting screws passed through threaded apertures formed in the top of the hangers and extending to the slots whereby the screws are adapted to engage the rods, two shafts 17 passed through the lower part of the frame and carrying cams adapted to engage the bottom of the pan, a main shaft 20, and another 30, journaled in the frame, pitmen connecting the hangers with the shaft 30, and suitable connections whereby motion may be transmitted from the shaft 20 to the shafts 17 and 30, as and for the purpose set forth.

2. In a concentrator, the combination with the stationary frame, of the movable pan, hangers attached to the pan at one extremity and to the frame at the opposite extremity, the upper part of the hangers being slotted vertically to receive supporting rods passed through the frame, adjusting screws passed through apertures formed in the top of the hangers and communicating with the slots, whereby the screws are adapted to engage the rods, shafts 17 passed through the lower part of the frame and carrying cams adapted to engage the bottom of the pan, shafts 20, 30 and 31 journaled in the frame, pitmen leading from shaft 30 to the hangers supporting the pan, a stationary hopper support in the framework, a false hopper movably supported in the stationary hopper, said false hopper being adapted to screen the material, a pitman leading from shaft 31 to the false hopper, and suitable connections between shafts 20, 17, 30 and 31, whereby the requisite motion may be transmitted from shaft 20 to the pan and the false hopper, as and for the purpose set forth.

3. In a concentrator, the combination with the stationary frame, of the pan provided with riffles, the hangers attached to the pan at one extremity and to the frame at the opposite extremity, shafts 17 journaled in the lower part of the frame and carrying cams engaging the bottom of the pan, said shafts being suitably connected, a main shaft 20 to which power is applied, a shaft 30 journaled in the frame, means leading from the shaft for imparting the oscillating movement to the pan, and means for connecting shafts 30 and 17 with shaft 20 whereby the rotation of the last named shaft communicates motion to the other shafts, substantially as described.

4. In a concentrator, the combination with the stationary frame, of the pan carrying the riffle-frame, the hinged, inclined trough located above the pan, the screen located above the trough, the hangers attached to the pan at one extremity, and to the frame at the opposite extremity, shafts journaled in the lower part of the frame and carrying cams engaging the bottom of the pan, said shafts being connected by chains engaging sprockets on the shafts, a main shaft 20 to which the power is applied, a shaft 30, pitmen connecting the shaft 30 with the hangers supporting the pan, and means for connecting shafts 30 and 17 with shaft 20, whereby the requisite movements may be imparted to the pan, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

ROBERT L. CHATTERSON.

Witnesses:
G. J. ROLLANDET,
CHAS. E. DAWSON.

[Defendant's Exhibit "E"—Drawings and Specifications of Letters Patent No. 526,242, to L. Look, Patented September 18, 1894.]

[Endorsed]: Mine & Smelter Supply Co. vs. Arizona Copper Co. Defendant's Exhibit "E." Patent to L. Look, #526,242. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "E." Received Aug. 20, 1913. F. D. Monckton, Clerk.

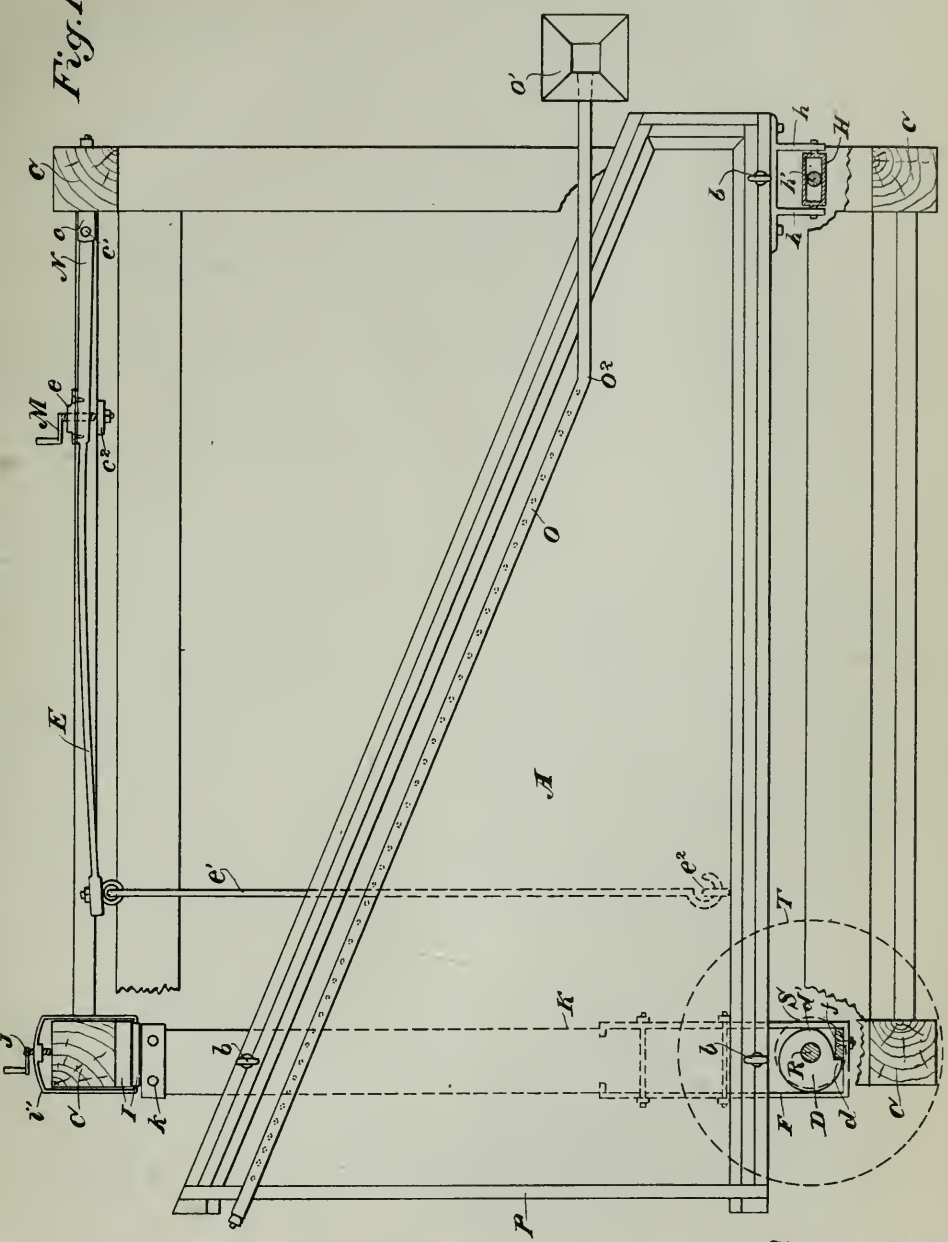
(No Model.) 2 Sheets—Sheet 1. 336

L. LOOK.

ORE CONCENTRATOR.

No. 526,242. Patented Sept. 18, 1894.

Fig. 1.



Witnesses;
J. L. Morse
F. F. Ascheck

Inventor;
Luther Look
By Dewey & Co.
Attys

L. LOOK.

ORE CONCENTRATOR.

No. 526,242. Patented Sept. 18, 1894.

Fig. 2.

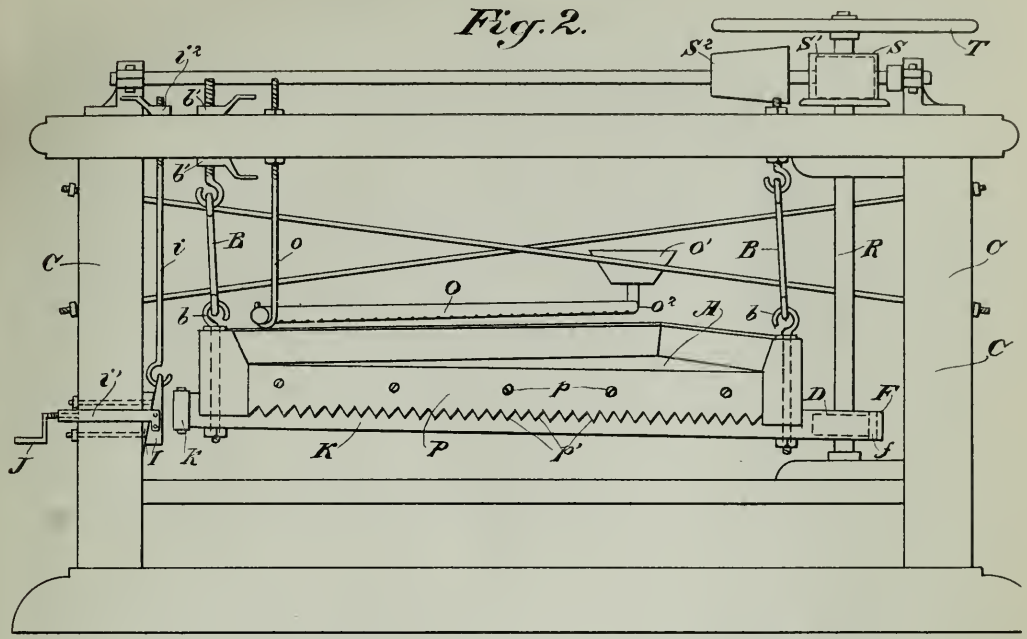


Fig. 3.

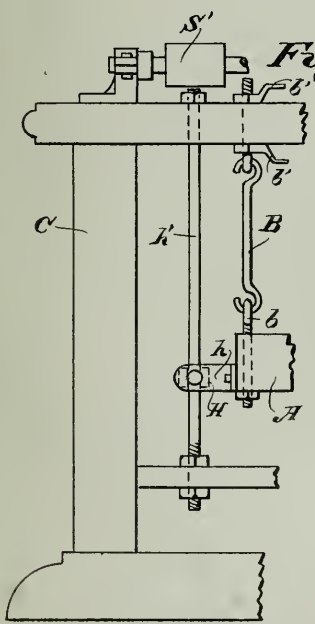


Fig. 4.

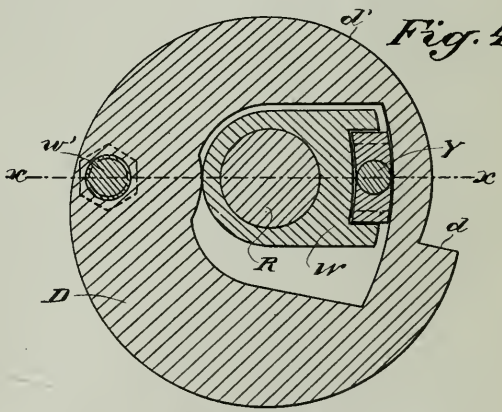


Fig. 5.

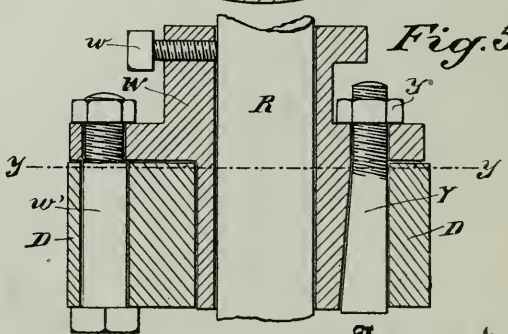
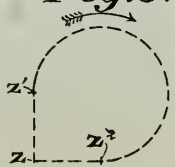


Fig. 6.



Witnesses,
L. Morse
H. F. Ascheck

Inventor,
Luther Look
By Dewey & Co. Attys

UNITED STATES PATENT OFFICE.

LUTHER LOOK, OF SOLDIER, IDAHO.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 526,242, dated September 18, 1894.

Application filed November 24, 1893. Serial No. 491,880. (No model.)

To all whom it may concern:

Be it known that I, LUTHER LOOK, a citizen of the United States, residing at Soldier, Logan county, State of Idaho, have invented an Improvement in Ore-Concentrators; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that class of concentrators in which eccentric movements are imparted to a table, and especially to that type commonly known as "percussion or bumping tables."

My invention consists of a table having imparted to it, at one end, a circular swinging motion, combined with a side bump, and at the other end a reciprocating end shake or motion.

It also consists in the novel means for imparting said motions and bump and varying them relatively according to the needs of the machine; and it finally consists in the novel details of construction, arrangement and combination relating to the table, and other parts, all of which I shall hereinafter fully describe and specifically claim.

The general object of my invention is to provide by the peculiar motion at the head of the table, for the effective feed of the pulverized ore, thereby increasing the capacity of the machine and improving the quality of the result, and by the swinging motion and the bump at the other end of the table to produce an effective settling action similar to the action of a gold pan, and to draw the mineral to one side as fast as it is settled, the whole resulting in the continuous and automatic discharge of the different classes of concentrates and the tailings.

Referring to the accompanying drawings for a more complete explanation of my invention,—Figure 1 is a top view of my concentrator. Fig. 2 is an elevation of the lower end of same. Fig. 3 is an elevation of one corner of the upper end. Fig. 4 is a horizontal section of the variable eccentric D. Fig. 5 is a vertical section of same on line x—x of Fig. 4. Fig. 6 is a diagram showing the movement of the lower end of the table.

A is the table which, as shown in Fig. 1, is preferably triangular in shape, which form greatly facilitates its successful working at the same time that it economizes material. This table is made preferably of wood, and is covered with suitable material to make a proper concentrating surface. A thin sheet of rubber or of water-proof canvas will serve the purpose, for to these materials the fine mineral particles adhere well. The rubber sheet or waterproof canvas surface also prevents the water from coming in contact with the wooden frame and bottom of the table. The table is suspended from the top part of the frame by means of eye bolts b (Fig. 2) and hanger rods B (Figs. 1, 2 and 3). The table is supported by three of these hangers, as indicated in Fig. 1, one at the upper or head end, and one at each of the two lower corners. The upper eye-bolt b at the head of the table, and also that at the side where the mineral or concentrates are discharged are provided with hand screws or thumb-nuts b' for the purpose of adjusting the incline of the table in the direction of its length, and also laterally, the table being higher at the head or feed end and also at the side where the concentrates are discharged.

C are the corner posts and sill portions of the frame which supports the table A.

D is an adjustable or variable eccentric cam. This cam, in connection with the spring E, produces the different motions of the table. A horizontal section of the eccentric cam is shown in Fig. 4, and a vertical section of same is shown in Fig. 5.

The construction and adjustment of the eccentric cam are as follows: At W (Figs. 4 and 5) is shown a portion of the eccentric cam which is fastened rigidly to the shaft R by means of set screws, as at w in Fig. 5. The top or flange portion is omitted in Fig. 4, for the purpose of showing the lower part of the same. The adjustable portion of the eccentric cam is shown by D. This part is pivoted to the rigid portion by means of the bolt or pin w'. The center of the adjustable part D is cut away, as seen in Fig. 4, to allow it to swing laterally on the rigid portion W between certain limits.

Y shows a tapering key with a set or lock nut y at the top. To adjust the eccentric cam, the nut y and key Y are loosened; the eccentric cam is then swung on the pivot pin w' to the point required, and then the key and nut are tightened to hold them in place.

By these means the eccentric cam may be given any amount of throw required from nothing up to an inch or more. When the notch at d, the center of the key Y, and the center of the pin w' are in line, the eccentric cam has no throw, except that permitted by the tapering notch d, d' while as shown in Fig. 4, it has the full stroke. This eccentric cam is cut away at d, shown in Fig. 4, and the notch gradually tapers to point d', where it runs out and the circle of the eccentric is complete the other three-fourths of the circumference.

At F, Figs. 1 and 2, is shown a box or stirrup in which the eccentric cam revolves and by which motion is given to the table. The eccentric cam revolves freely in this box and has a bearing on three sides at different parts of the revolution, the side toward the table being open as the cam does not touch it at any part of the stroke.

At f (Fig. 1) is a lug or block bolted on the box or stirrup F on the inner side, and this lug is equal in length to one-half the diameter of the eccentric cam, and is as thick as the depth of the notch or offset d in the periphery of the eccentric cam. This box or stirrup F extends under the table and is bolted to the side of the bumping bar K.

E (Fig. 1) is a spring, preferably made of wood which is supported at the end N by two lugs c bolted to the post C of the main frame. Should this spring become bent from use, it can be reversed and used again. A pin c' passes through the lugs c and the end of the spring, and the latter can turn on this pin as a pivot. A hand or crank screw M passes through a nut e fastened to the spring, and the end bears against a lug c^2 fastened to the side of the main frame. By means of a hooked rod e' the spring is attached to the table A and draws laterally from an eye bolt e^2 attached to the under side of the table. As the hand screw M is tightened, the lug or block f on the stirrup F is drawn against the edge of the eccentric cam D at all parts of the stroke, except in the notch d. The bumping bar K, to which the cam stirrup F is bolted, extends across the under side of the table to which it is bolted, and projects beyond the edge of the table, and is bound with an iron band k to prevent it from splitting (Fig. 2).

At I (Figs. 1 and 2) are shown two metal wedges or bumping blocks. These blocks are designed to regulate the length of the lateral bump of the table. The inner one is bolted rigidly to the post C with the thin end of the wedge down; while the outer wedge which is suspended from the top of the frame by a hooked rod i has the thick end down, and has a stirrup or bail i' bolted to the edges and extending around the corner post C. A hand or crank screw J passes through the center of this bail with the point of the screw bearing against the outer or opposite side of the corner post from the wedges. By loosening the hand screw J, and raising the outer wedge I by means of the thumb or wing nut i^2 the outer wedge is forced farther from the post by the inclined slope of the inner wedge, which shortens the lateral bump of the table, when the crank screw is again tightened, which makes the bumping wedges equivalent to a part of the solid post.

At H (Figs. 1 and 3) is a slotted roller supported by two lugs h which are bolted to the side of the oscillating table near the head end. A stout rod h' which is supported at each end by the main frame, passes vertically through the slot in this roller H, and serves as a pivot, and also as a guide for the upper or head end of the table.

At O (Figs. 1 and 2) is shown a perforated pipe which extends along the inclined or sloping side of the table near the edge, and is supported by hangers o from the frame above. It does not touch the oscillating table or come in contact with it at any point. It is designed to supply clear water to that side of the table, when the table is in operation, and may be made in sections for convenience in transportation. It is provided with a funnel o' at the head, to take the water the more readily, and the perforations extend from the point o^2 (Fig. 1) to the lower end of the table.

Fig. 6 shows an outline of the figure produced at the lower end of the table by one revolution of the eccentric cam D. Start at the point Z with the bumping bar K held firmly against the bumping blocks I by the spring E. The notch d on the eccentric cam D has just passed the lug f on the inner side of the cam box or stirrup F. The first quarter of a revolution of the eccentric cam carries the oscillating table to the point Z' on the outline of the figure. During the next three-fourths of the revolution, the outline of the figure produced by the table at and near the eccentric cam, is more or less of a circle, with a diameter equal to the throw of the eccentric. When the notch d on the eccentric cam has come past the lug f on the inner side of the cam box F, the lug is drawn into the notch by the tension of the spring E, and the outline of the figure 6 from Z^2 to Z is completed. Different adjustments will produce different figures. By raising the adjustable bumping block I to its full height, the lug f will be held from dropping into the notch d, and the table will have no side bump, and the figure of revolution will be a half circle, with a diameter equal to the throw of the eccentric. When the eccentric is adjusted to have no throw, and the adjustable bumping block I is lowered to the lowest point, the outline of the figure will be almost a straight line laterally. In other words it will be all side bump and no end shake. The upper or head end of the table is prevented by the slotted roller H and the rod h' from having any lateral or side motion or bump, the motion at this point being an almost straight end shake. The outline of the figure of revolution pro-

duced at different points on the length of the table will be different, being a straight line in the direction of its length at H, and a more or less complete circle at the cam box F. By adjusting the eccentric cam to the center of the shaft, and the bumping block I to the highest point, there will be neither end nor side shake.

At P (Figs. 1 and 2) is shown an apron-board which is designed to hold the rubber or canvas covering of the table securely in place at the lower end. It is held in place by screws p and the lower edge extends down below the other parts of the oscillating table, and is notched or serrated along the lower edge, as shown at p'. These notches or saw teeth prevent the water and sand or ore from traveling laterally to the lowest side of the table. The upper end of the table is to be provided with a feed hopper with a perforated bottom. This is not shown. This feed hopper distributes the pulverized ore evenly and smoothly over the upper end of the table.

The operation of the machine is as follows—The pulverized ores are fed on to the oscillating table at the upper or narrow end, through the perforated hopper, and are moved down the table by the combined action of the flow of the water due to the incline and the end shake action of the table at this end. As the ores move down, they come more under the influence of the side shake and the side bump. These two motions, combined with the end shake, produce the oscillating or circular swinging motion before described. This oscillating motion loosens up the pulverized ores, and keeps them "alive" which allows the minerals which have greater specific gravity than the quartz, sand, or gangue, to settle through the sand, until they get to the bottom, in contact with the rubber or waterproof covering of the table. The downward motion of the mineral is now retarded, while the effect of the side bump is increased, causing the mineral and sand to move gradually toward the side at which the bump takes place, while moving downwardly; but the mineral moves laterally at a faster rate than the sand, and is drawn from under it, while the sand is held back by the backward and downward action of the water from the jets of the clear water pipe at that side. This action continues on down to the lower end; the bumping action holding the mineral near the side under the jets of clear water, the oscillating action settling the mineral and causing the lighter sand to come to the surface, and the clear water holding the lighter sand and gangue back and moving it down to the lower end of the table. The side of the table at which the bump takes place is raised slightly higher by means of the adjustable hanger at that side, than the opposite side. This causes the clear water from the jets to move downward and laterally in the opposite direction, and assists in holding the sand back. By the time the mineral and sand have reached the lower end of the table, the separation is very complete, so much so that minerals of different specific gravities can be separated from each other. Motion is given to the cam shaft R through the pulleys S, S′ and S^2. A fly-wheel is provided at T. Suitable sliding boxes or troughs are to be provided for conveying away the different minerals from the lower end of the machine, and also for carrying away the tailings.

The effect of the serrated edge of apron P may be fully described as follows:—The table being inclined laterally, the mineral particles and the sand travel upwardly toward the bumping side of the table. The mineral particles travel faster and thus separate from the sand; but the down flowing water which should drop off clean and perpendicularly from the lower edge of apron P, would not do so if said edge were smooth, but would cling to and run along down the edge and thus would tend to carry the mineral particles back again to the sand; but by reason of the toothed edge of the apron, the water and the separated materials all drop off clean and sharp.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the freely swinging triangular table or bed provided with suspension devices and having a pivotal longitudinally sliding connection at its head end, of a horizontally turning notched cam at one side of the foot end of the table, a strap or bearing on the table in which said cam works, a bumper at the opposite side of the table from said cam, a spring throwing the table transversely toward the bumper, and against the action of which the cam works, substantially as herein described.

2. The combination with the freely swinging triangular table or bed provided with suspension devices, one or more of which are adjustable to regulate the inclination of the table said table being provided at its head end with a pivotal longitudinally sliding connection preventing lateral sliding at that end, and a shouldered strap or bearing at one side of the opposite end of the said table, of a horizontally turning notched cam in the strap or bearing, a bumper in the path of the table opposite the cam, and a spring throwing the table toward the bumper and against the action of which said cam works, substantially as herein described.

3. The combination with the table and its shouldered strap or bearing, of the operating shaft and a two-part cam thereon, one section of which is rigidly secured to the shaft and the other section of which has a slot or opening receiving said first part, the two sections being pivotally connected beyond the shaft, and means for adjusting the two sections relatively one to the other; the outer section having a circular periphery provided with a notch, whereby by adjusting the said sections

the outer section may be made concentric or eccentric to the said shaft, substantially as herein described.

4. In an ore concentrator, the cam consisting in the outer section D, having a circular periphery provided with a notch *d d'* and with an opening or slot, and the inner relatively stationary section W apertured to receive the shaft, lying within the said slot or opening and pivoted therebeyond to the outer section as at *w'*, and the wedge bolt *y*, working between the two sections to clamp the outer section D to the section W eccentric or concentric to its shaft opening, substantially as herein described.

5. In an ore concentrator, the swinging substantially triangular inclined concentrating table or bed, in combination with the means for imparting to the foot end thereof a substantially circular motion and a side bump, consisting of the stirrup on one side of the table having a lug within it, the adjustable notched eccentric cam operating within said stirrup, the spring on the other side of the table, or bed, and the adjustable bumper wedges I and bumper bar K on said side, substantially as herein described.

6. In an ore concentrator, the swinging substantially triangular inclined concentrating table or bed, in combination with the means for imparting to the foot end thereof a substantially circular motion and a side bump, consisting of the stirrup on one side of the table having a lug within it, the adjustable notched eccentric cam operating within said stirrup the spring on the other side of the table, or bed, and the adjustable bumper wedges I and bumper bar K on said side, and the means for imparting an approximately lineal reciprocation to the other end of the table or bed, consisting of the slotted roller secured thereto and the guide rod passing through the roller, substantially as herein described.

7. In an ore concentrator having a percussion table or bed, the bumper blocks, consisting of the fixed wedge, the movable oppositely inclined wedge operating on the face of the fixed wedge, the hanger with thumb nut for adjusting the movable wedge and the bail with set screw for setting said wedge, substantially as herein described.

8. In an ore concentrator having the inclined shaking concentrating table or bed, the apron strip P at the lower end or foot of the table or bed, and having the serrated or notched edge, substantially as herein described.

In witness whereof I have hereunto set my hand.

LUTHER LOOK.

Witnesses:
W. FINNEY,
S. A. CLUER.

[Defendant's Exhibit "F"—Drawings and Specifications of Letters Patent No. 349,504, to H. C. Krause, Patented September 21, 1886.]

[Endorsed]: Mine & Smelter Supply Co. vs. Arizona Copper Co. Defendant's Exhibit "F." Patent to H. C. Krause, #349,504. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "F." Received Aug. 20, 1913. F. D. Monckton, Clerk.

UNITED STATES PATENT OFFICE.

CHARLES F. PIKE, OF PHILADELPHIA, PENNSYLVANIA.

ORE WASHER AND SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 566,534, dated August 25, 1896.

Application filed March 4, 1895. Serial No. 540,402. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. PIKE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain new and useful Improvements in Ore Washers and Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to letters of reference marked thereon, which forms a part of this specification.

My invention has relation to ore washers and separators or concentrators, and more particularly to that class of apparatus or machines adapted to the working of placer-gravel.

It has long been known that placer-gravel cannot be profitably worked except by a rapid treatment of large quantities of the material, while it is essential that said material should be thoroughly washed.

In rapidly treating large quantities of placer-gravel the black sand contained therein accumulates very rapidly and fills and packs in the riffles, which then become inoperative, the metal passing off the riffled plate with the successive accumulations as soon as the riffles are packed with such sand. This difficulty I have effectually overcome, and am enabled to thoroughly wash the ore, by immersing the screen or screens, as well as the riffled plate beneath the same, in a body of confined water, in contradistinction to the use of running water, and by imparting to said screen or screens and riffled plate a reciprocating or jigging motion in the direction of their length, whereby the material on the screens and riffled plate receive successive short forward movements, thereby scattering said material and keeping the same alive in the body of water, enabling the particles of metal to freely separate from the gravel and black sand and subside, said particles of metal passing with the black sand from the screens to the riffled plate, where the metal is concentrated by the riffles, as fully described in Letters Patent of the United States granted to me under date of November 13, 1894, No. 529,307.

Although the results obtained by the method of treatment referred to could not be obtained by any of the older methods, in that I have been enabled to separate and recover such of the finer or lighter particles of metal which could not be recovered by the said older methods of operation or treatment, I have since discovered that the separation may be made still more complete without lessening the quantity of material treated, and without decreasing the rapidity with which said material is treated. This I attain by imparting to the riffled plate a rising-and-falling motion, as well as a longitudinal reciprocating motion, whereby the black sand on the plate is more effectually kept alive, in that it is kept in constant motion, the riffled plate rising during its backward movement and falling during its forward movement, imparting an additional impulse to the material thereon that tends to more thoroughly scatter the same in the body of water, thereby facilitating the separation and subsidence of the particles of metal.

My invention therefore consists in imparting to the riffled plate a jigger motion, and simultaneously therewith a rising-and-falling or vertically-oscillating motion, in a body of confined water, as will now be fully described, reference being had to the accompanying drawing, in which I have shown by a vertical section an ore washer and separator or concentrator embodying my invention.

A indicates a suitable vessel adapted to contain a body of water. S S′ S^2 are the screens, and R the riffle-plate below said screens, the upper screen S having the coarsest mesh and the lower screen S^2 the finest mesh. The screens and riffled plate are journaled near their rear and forward ends to two pairs of levers *l* and *l′*, respectively, and receive a reciprocating motion from an eccentric E, connected by rod *r* with one of the levers *l*.

Any suitable discharging device may be provided for the removal from vessel A of the tailings, and the screen and riffled-plate tailings, *i. e.*, the gravel and black sand, may be removed together or separately. For instance, the screen-tailings may be discharged into a separate receiver within vessel A and discharged by a suitable conveyer C, while the black sand may be separately discharged by means of a suitable suction device, for in-

stance, as described in Letters Patent above referred to, and as these devices do not form a part of this invention I have not deemed it necessary to illustrate the suction device or describe either discharge device in detail. The ore or placer-gravel is fed to the head of the upper screen S from a feed chute or trough T, and T' is the discharge chute or trough.

The rising-and-falling or vertically-oscillating motion is imparted to the riffled plate R by means of an eccentric E', connected with said plate by a link *e'*, rotary motion being imparted to the shaft *s* of said eccentric in any suitable manner, said shaft having its bearings in the vertical walls of vessel A, suitable stuffing-boxes being provided to prevent escape of water. This reciprocating motion of the riffled plate in opposite directions has for its result to maintain the black sand in continuous motion, thereby facilitating the scattering thereof in the body of confined water and the separation of the particles of metal from the sand, which are caught by the riffles, behind which they collect, and are removed from time to time.

I do not desire to limit myself to the precise means described and shown whereby a vertical reciprocation is imparted to the riffle, as other means whereby this result can l tained may be used.

Having thus described my invention, I claim as new therein, and desire to secu Letters Patent, is—

In a machine for working placer-gra vessel adapted to contain a body of wa plurality of superposed screens, and a r plate below the same arranged for imme in such body of water, rock bars or lev which the screens are pivotally connect both ends, and a pivotal connection bet the head of the riffled plate and the ba levers *l;* in combination with mechanis imparting a rocking motion to said ba levers *l*, and mechanism at or near the end of the riffled plate adapted to imp vertical oscillating motion to said plate pivots independently of the screens, fo purpose set forth.

In testimony that I claim the foregoi my invention I have signed my name in ence of two subscribing witnesses.

CHARLES F. PIK

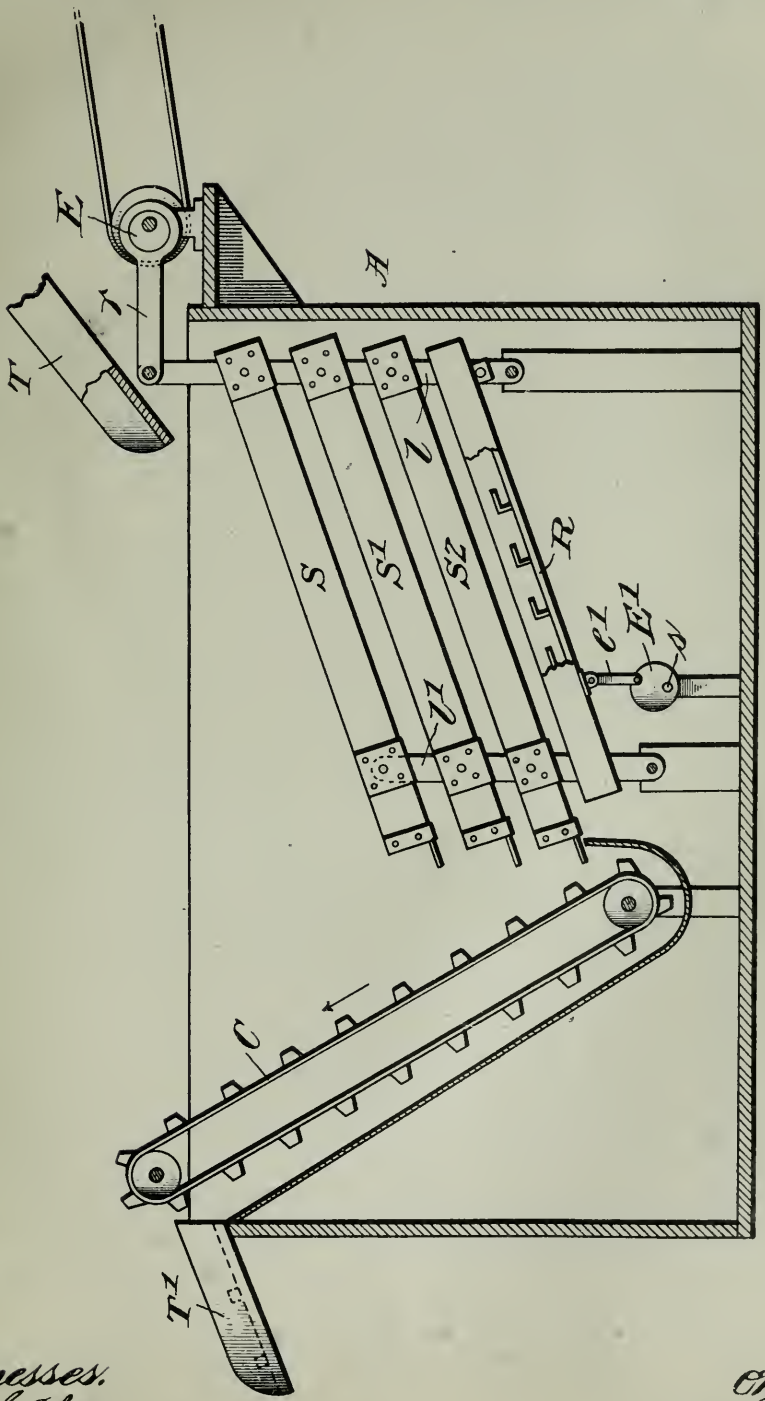
Witnesses:
A. P. FRITZ,
THOS. S. RODGERS.

(No Model.)

C. F. PIKE.

ORE WASHER AND SEPARATOR.

No. 566,534. Patented Aug. 25, 1896.



Witnesses.
C. S. Oberly
Henry Orth

Inventor.
Chas. F. Pike.
By Henry Orth
Atty

[Defendant's Exhibit "H"—Drawings and Specifications of Letters Patent No. 533,362, to J. Lampert, Patented January 29, 1895.]

[Endorsed]: District Court of the Fifth Judicial District of Arizona. The Mine and Smelter Supply Co. vs. Arizona Copper Co. In Equity #21A. Defendant's Exhibit "H." Lampert Patent #533,362. A. M. Parkins, Special Examiner. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "H." Received Aug. 20, 1913. F. D. Monckton, Clerk.

ORE SEPARATOR.

No. 349,504. Patented Sept. 21, 1886.

Fig. 1.

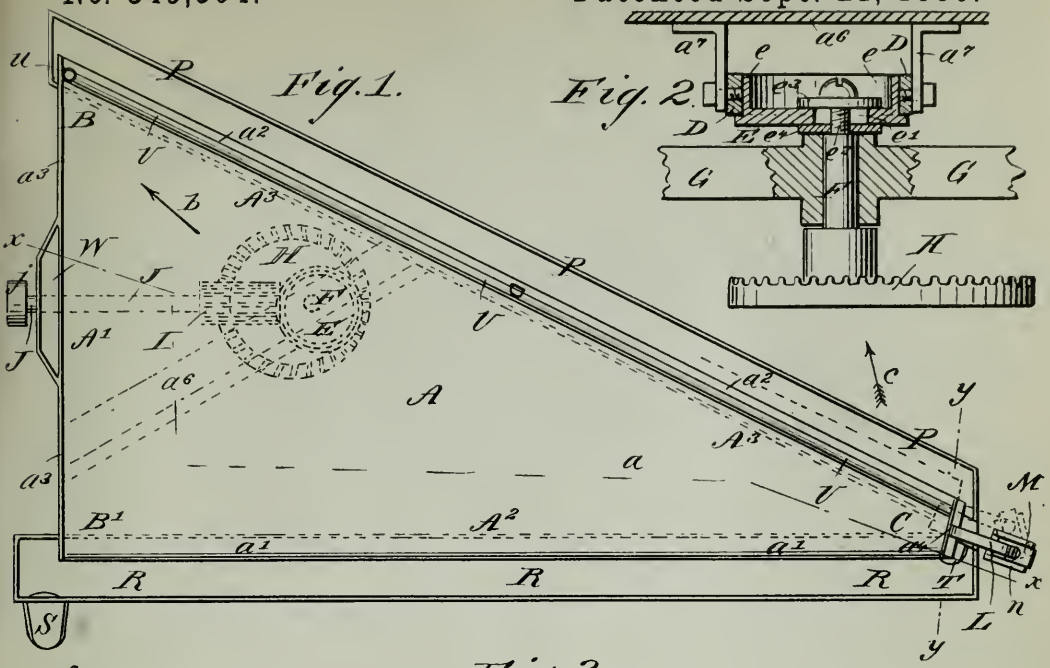


Fig. 2.

Fig. 3.

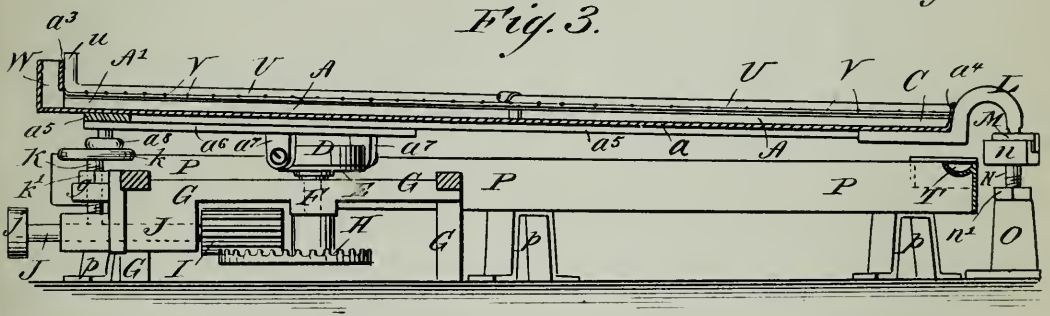
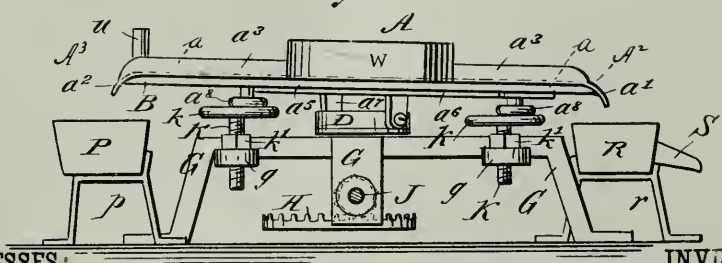


Fig. 4.



WITNESSES:

Geo. Switchell.

C. Sedgwick

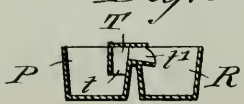
INVENTOR:

H. C. Krause

BY Munn & Co.

ATTORNEYS.

Fig. 5



HENRY C. KRAUSE, OF LAKE LINDEN, MICHIGAN.

ORE-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 349,504, dated September 21, 1886.

Application filed April 27, 1886. Serial No. 200,289. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. KRAUSE, of Lake Linden, in the county of Houghton and State of Michigan, have invented a new and Improved Ore-Separator, of which the following is a full, clear, and exact description.

My invention relates to machines for separating and grading ores, and has for its object to provide a simple, comparatively inexpensive, and effective machine whereby ores of various kinds may be washed and concentrated, and the valuable mineral and the tailings separately and closely graded, and with economy of time and labor.

The invention consists in certain novel features of construction and combinations of parts of the machine, all as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of my improved ore-separator. Fig. 2 is an enlarged detail vertical sectional elevation showing the driving-gearing by which the pan is agitated bodily. Fig. 3 is a vertical sectional elevation taken on the irregular line $x\ x$, Fig. 1. Fig. 4 is an end view of the front end of the separator; and Fig. 5 is a detail vertical sectional elevation across the mineral and tailings boxes, and taken on the line $y\ y$, Fig. 1.

The separator-pan A is formed of a flat plate, a, having downturned aprons $a'\ a^2$, respectively, at the tail and head edges, and upturned flanges $a^3\ a^4$ at the front and back ends, respectively. The front end, A′, of the pan lies about at a right angle with the tail A^2 of the pan, and the head A^3 runs obliquely from the corner B of the pan toward the back end, C, of the pan, and preferably at an angle of from twenty-five to thirty degrees to the tail A^2. (See Fig. 1.)

To the bottom of the pan-plate a is fixed a marginal stiffening-frame, a^5, to which is fastened a bearer-plate, a^6, having lugs $a^7\ a^7$, to and between which is journaled a gimbal-ring, D, which fits loosely upon a flange, e, of a plate, E, which is held to the top of a shaft, F, journaled in a frame, G, fixed to the floor of the mill-house. The plate E is slotted at e' for the passage of a screw-bolt, e^2, which also passes through washers or clamp-disks e^3 e^4, above and below the plate, on its way to the shaft F. With this construction the flanged plate E may be adjusted eccentrically to the shaft more or less, to control the bodily horizontal throw of the pan, for purposes presently explained.

To the shaft F there is fixed a crown gear-wheel, H, the teeth of which are arranged eccentrically to the shaft, and this wheel H meshes into a long pinion, I, fast on a driving-shaft, J, journaled in the frame G, and having a pulley, j, to which a power-transmitting belt will pass from any convenient motor.

The flanged eccentric plate E and the eccentric crown gear-wheel H will be set to give an accelerated horizontal motion of the pan A toward its front head corner, B, in direction of the arrow b, and by adjusting the eccentric plate E any required extent of bodily throw may be given the pan in this direction, as the class of ores being separated may require.

The front end, A′, of the pan is provided, preferably, with fixed bearer-feet $a^8\ a^8$, which rest loosely on the tops of the large heads $k\ k$ of screws K K, which are threaded into lugs $g\ g$ of the frame G, and are provided with stop or jam nuts $k'\ k'$. By adjusting the screws K K the front end, A′, of the pan may be raised to give the desired inclination from said front end to the rear end, C, and also to give the desired inclination to the front end of the pan from its tail corner, B′, to its head corner, B. A preferred downward incline or pitch from B to B′ is about one-quarter of an inch to the foot; but the front end of the pan will be inclined this way more or less, as the ores being worked shall require. The gimbal-ring D will slip on the flange e of the eccentric plate E, to allow any necessary adjustment of the head of the pan, as above described, and also to accommodate vertical adjustment of the end C of the pan, as next explained.

To the pan A, at its end C, is fixed an arm, L, the outer part of which is bowed, and at the extremity of the arm there is swiveled a shoe or bearing-block, M, which is adapted to slide in the grooved head n of a screw, N, which is provided with a jam or lock nut, n',

and is threaded into a pedestal, O, on the mill-floor, as shown in Figs. 1 and 3 of the drawings. By loosening the nut n' the screw N may be raised or lowered in the pedestal O, and thereby vertically adjust the end C of the pan A, to give any necessary downward inclination to the pan from its front end toward its rear end. A preferred inclination of the pan in this way is about five-sixteenths of an inch to a foot; but the incline or slope may be varied by vertically adjusting the screw N and setting it by the lock-nut n', as the class of ores being worked may require. This means for supporting the end C of the pan not only allows vertical adjustment of the pan at that end to give it proper slope, but also provides for giving this end of the pan a greater or less extent of lateral throw toward and over the mineral-box P, which is supported by suitable leg-frames. p, or otherwise, beneath the head A^3 of the pan, to receive the washed and graded mineral from the pan. It is obvious that when the back end, C, of the pan is set vertically the screw N may be locked by the nut n', so as to hold the groove or slideway of the screw-head n at any desired angle to the stroke-line of the pan; hence when the head n is locked in the position shown in full lines in Fig. 1 the head of the pan at or toward its end C will receive very much less lateral movement in direction of the arrow c than it will receive when the head n of screw N is adjusted at a greater angle to the stroke-line of the pan, as shown in dotted lines. The lateral bodily movement of the back end of the pan in direction of arrow c is given as the pan is thrown or carried with accelerated movement in the direction of the arrow b by the eccentric gearing above described; hence this lateral motion of the back end of the pan will likewise be a comparatively quick one, and as the block M may be adjusted to a nicety to move at any angle to the general stroke-line of the pan, the finer ores passing toward the tail of the pan may be effectively separated and graded, as well as the coarser ores at and toward the head of the pan.

The tailings-box R is supported on suitable leg-frames, r, beneath the tail edge A^2 of the pan, and has a discharge-spout, S, and the back ends of the mineral-box P and the tailings or refuse box R will preferably be connected by a conduit, T, having an opening at t into the box P at about half the height of the box, and another opening at t' into the box R, whereby excess of water may pass off from the mineral-box to the tailings-box, and thence out at the spout S.

Water is supplied to the pan from a pipe, U, which ranges along and about parallel to the head A^3 of the pan, and just back of where the head-apron a^2 bends down from the main body of the pan. This pipe U will be connected to any source of water-supply at its end u by a flexible tube or pipe, allowing agitation of the pan, and the water will be delivered from pipe U into the pan in gradually-diminishing quantity or volume from the front end toward the back end of the pan, either by means of holes V of like size made in the pipe U at increasing distances apart toward the tail of the pan, or by holes V having gradually smaller sizes toward the back end, C, of the pan, and placed at like distances apart along the pipe, or by holes V made gradually smaller and also spaced farther apart toward the back end, C, of the pan, as may be preferred.

This graduated supply of water to the pan A allows the coarser and finer ore particles on the pan to be thoroughly washed with a minimum quantity of water, thereby not only avoiding waste of the water, but also preventing a washing and waste of the finer valuable ore particles back over the apron a' into the box R with the gangue or tailings.

The continuous operation of the machine is as follows: The crushed ore or gangue from the stamps will be fed onto the pan A through a box or chute, W, located at the front end of the pan, about over the driving-shaft J, it being understood that the plate E had been set to give the desired extent of bodily throw of the pan in direction of the arrow b, and that the pan had been set to incline properly from B to B', and from B B' to C, and that the slide-block bearing N n had been adjusted at proper angle to give the desired extent of lateral throw to the back end of the pan in direction of the arrow c. As the pulp or gangue flows toward the back end, C, of the pan, the quick or accelerated movement of the pan toward its highest point B, in direction of the arrow b, will carry or throw the heavier particles of ore toward that point, and the lighter ore particles will arrange themselves lower down the slope, according to their weight, and the current of water from the pipe U will wash all the worthless or comparatively worthless material over the apron a' of the pan into the tailings-box R, while the valuable mineral, by the forward impetus or momentum of the pan in direction of arrows b and c, will be carried over the head-apron a^2 of the pan into the mineral-box P in condition for smelting. The bearer-screws K K and N may be adjusted vertically at any time to alter the inclinations of the pan while the machine is running, to regulate the washing, concentration, and separation of the ores more closely as the work progresses.

It is obvious that the valuable mineral will not only be concentrated, but will be separated or graded into different sizes in the box P, with the larger particles at and toward the front of the pan, and the successively smaller particles ranging toward the back end, C, of the pan. The tailings or refuse will also be graded into different sizes in the box R, thus allowing the larger particles to be removed together and stamped or reduced for subsequent treatment, to recover what of value there may be in them.

Having thus fully described my invention,

claim as new and desire to secure by Letters Patent—

1. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle of from twenty-five to thirty degrees to its tail, substantially as described, for the purposes set forth.

2. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail of from twenty-five to thirty degrees, an ore-feeding chute, W, at the front end of the pan, and head and tail aprons, a^2 a', and front and back flanges, a^3 a^4, substantially as described, for the purposes set forth.

3. In an ore-separator, the pan A, made with a front end, A,′ and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail A^2 of from twenty-five to thirty degrees, in combination with mechanism for adjusting the pan-surface to give it backward slope from its front head corner, B, toward its front tail corner, B′, and toward its back end, C, substantially as described, for the purposes set forth.

4. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail A^2 of from twenty-five to thirty degrees, combined with mechanism for adjusting the pan vertically to give it a slope from its front head corner, B, toward its front tail corner, B′, and toward its back end, C, and mechanism for imparting an accelerated horizontal movement to the pan toward its front head corner, B, substantially as described, for the purposes set forth.

5. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail A^2 of from twenty-five to thirty degrees, in combination with mechanism for adjusting the pan to give it a downward inclination from front to back ends and from head to tail, mechanism for imparting an accelerated horizontal movement to the pan toward its high front head corner, B, and a water-distributing pipe arranged over and along the oblique head A^3 of the pan, and having orifices giving a downward discharge of water upon the pan toward its tail in gradually-diminishing volume from the front of the pan toward its back end, substantially as described, for the purposes set forth.

6. In an ore-separator, the pan A, made with a front end, A′, and tail A^2, arranged about at right angles to each other, and with an oblique head, A^3, set at an angle to the tail A^2 of from twenty-five to thirty degrees, in combination with mechanism for adjusting the head and tail of the pan to give it an inclination from the front head part, B, toward the front tail corner, B′, and toward the back end, C, mechanism for imparting a forward horizontal movement to the pan toward the front head corner, B, and a laterally-adjustable bearing at the back end, C, of the pan, with which said end is in sliding connection, substantially as described, for the purposes set forth.

7. The combination, in an ore-separator, of a pan having an oblique head, mechanism for giving the pan a downward slope from its front head corner, B, to its tail and back end, mechanism for imparting a horizontal forward movement to the pan toward its front head corner, B, and a laterally-adjustable bearing at the back end, C, of the pan, with which said end is in sliding connection, substantially as set forth.

8. The combination, in an ore-separator, of a horizontally-movable pan, an eccentrically-arranged flanged plate beneath and connected to the pan, a vertical driving-shaft, to which the eccentric plate is adjustably connected, and an eccentric driving gear-wheel on said shaft, substantially as described, for the purposes set forth.

9. The combination, in an ore-separator, of a horizontally-movable pan having an oblique head and a high front head corner, as at B, an adjustable eccentric flanged plate beneath and connected to the pan, and eccentric gearing imparting an accelerated horizontal bodily movement to the pan toward the front head corner, B, substantially as described, for the purposes set forth.

10. The combination, in an ore-separator, of a horizontally-movable pan, a gimbal-ring bearing, D, a vertical driving-shaft, an adjustable eccentric flanged plate working in said ring-bearing and connected to the driving-shaft, an eccentric gear-wheel, H, on said shaft, and a pinion, I, gearing with said wheel H, substantially as herein set forth.

11. The combination, in an ore-separator, of a horizontally-movable pan, an eccentrically-arranged flanged plate beneath the head of the pan, a shaft to which said flanged plate is connected, an eccentric gear-wheel on said shaft, and a swiveled sliding bearing supporting the back end of the pan, substantially as described, for the purposes set forth.

12. The combination, in an ore-separator, of a pan having an oblique head and a high front head corner, B, headed screws K K, arranged beneath the front end of the pan, an arm, L, connected to the back end of the pan, a slide-block, M, swiveled to said arm, and a screw, N, threaded into a support, O, and having a head, *n*, forming a guide for the block M, which thereby may be set at different angles to the stroke-line of the pan, and mechanism for imparting a horizontal movement to the pan toward its high front head corner, B, substantially as described, for the purposes set forth.

13. The combination, in an ore-separator, and with a horizontally-movable pan having

an oblique head and a front end and a tail arranged about at right angles to each other, and the surface of said pan sloping toward its tail and back end, of mechanism for imparting a forward movement to the pan toward its high front end corner, B, and mineral and tailings boxes P R, placed below the head and tail of the pan, respectively, substantially as described, for the purposes set forth.

14. The combination, in an ore-separator, and with the horizontally-movable pan A, constructed and operated substantially as specified, of mineral and tailings boxes P R arranged below the head and tail of the p respectively, said boxes being connected l conduit, T, next the tail of the pan, subst tially as herein set forth.

HENRY C. KRAUSE.

Witnesses:
WILLIAM JOHN BENNETT,
CHARLES H. KRAUSE.

[Defendant's Exhibit "G"—Drawings and Specifications of Letters Patent No. 566,534, to C. F. Pike, Patented August 25, 1896.]

[Endorsed]: Mine & Smelter Supply Co. vs. Arizona Copper Co. Defendant's Exhibit "G." Patent to C. F. Pike, #566,534. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

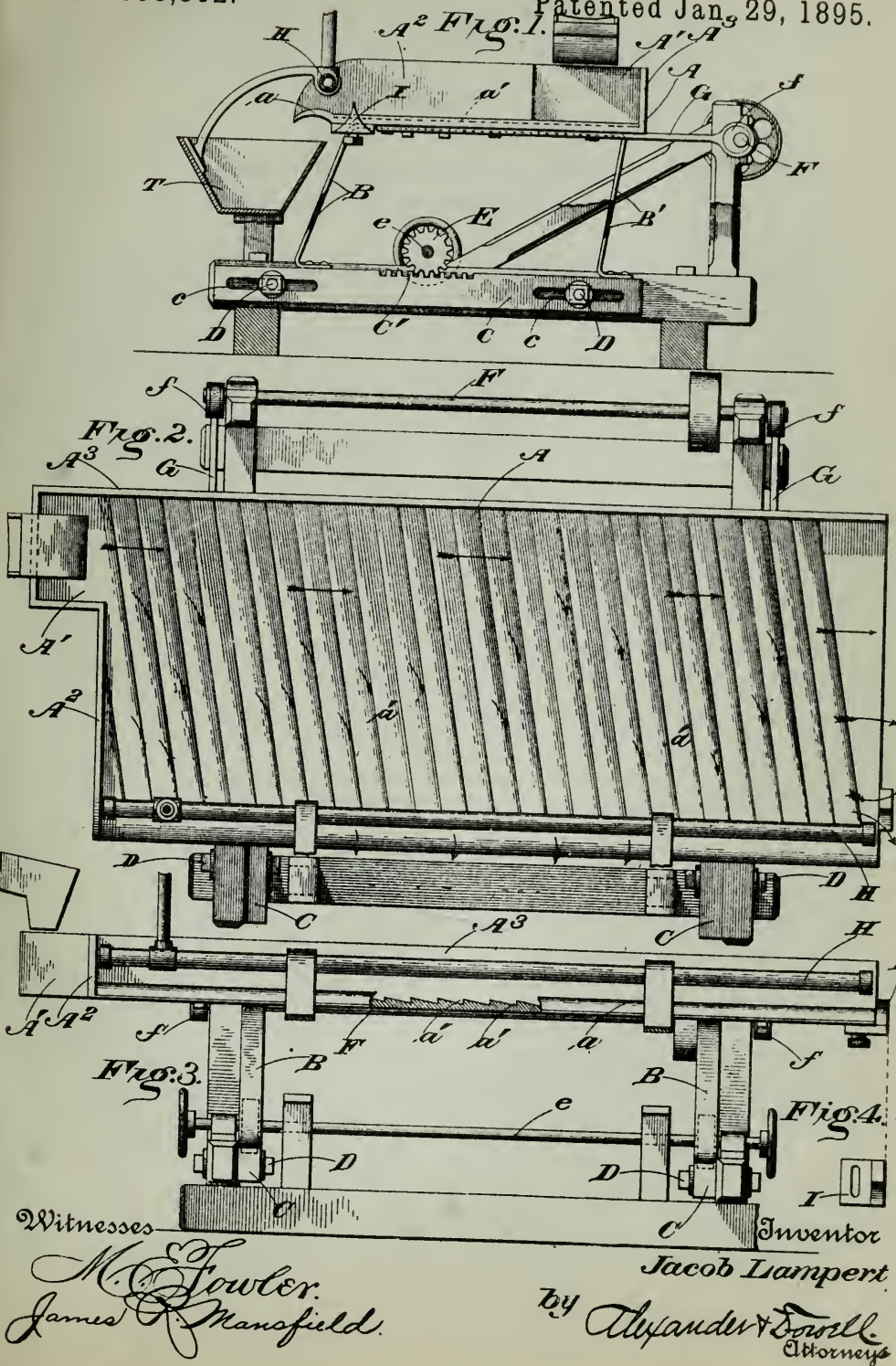
No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "G." Received Aug. 20, 1913. F. D. Monckton, Clerk.

(No Model.)

J. LAMPERT.

CONCENTRATOR.

No. 533,362. Patented Jan. 29, 1895.



Witnesses
M. E. Fowler.
James R. Mansfield.

Inventor
Jacob Lampert
by Alexander & Dowell
Attorneys

UNITED STATES PATENT OFFICE.

JACOB LAMPERT, OF HILL CITY, SOUTH DAKOTA.

CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 533,362, dated January 29, 1895.

Application filed March 16, 1894. Serial No. 503,917. (No model.)

To all whom it may concern:

Be it known that I, JACOB LAMPERT, of Hill City, in the county of Pennington and State of South Dakota, have invented certain new and useful Improvements in Concentrators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

This invention is an improved concentrator, especially designed for operating upon fine and light concentrates. The construction will be clearly understood from the accompanying drawings and the following detailed description thereof; and the essential features of the invention are set forth in the claims.

In the drawings:—Figure 1 is an end view of the concentrator, the nearest end frame being partly broken away. Fig. 2 is a top plan view, partly broken away. Fig. 3 is a front elevation, partly broken. Fig. 4 is a detail.

The shaking table A is mounted upon supports B, B′, which are preferably bar springs, capable of sustaining the table but permitting it to be vibrated laterally. These supports are connected to the table and to the base frame of the machine, in any suitable manner, but in order to provide for adjusting the inclination of table I propose to adjustably connect the lower ends of said supports to the base frame. As shown supports B are longer than supports B′, and the lower ends of adjoining supports, at each end of the frame, are fastened to a horizontal longitudinal movable bar C, which is secured to the end piece of the main frame, by means of bolts D, passing through horizontal slots *c* in the bar, and thereby allowing the latter to be longitudinally shifted. The bars C can be shifted by means of pinions E on a shaft *e*, suitably journaled on the main frame, said pinions meshing with racks C′ on the bars, as indicated in the drawings. The shorter supports B′ are under the rear side of table, and the longer supports under the front or delivery side thereof. By moving bars C backward, the front side of the table will be elevated, faster than the rear side, and by moving the bars forward the front side of table will be lowered faster than the rear side, because of the unequal lengths of the supports, and thus by simply adjusting bars C the table can be adjusted as desired. Of course various other means can be used for adjusting bars C, or the supports, so as to enable the table to be adjusted as desired by the operator.

The receiving end of the table has a short hopper or box extension A′ into which the pulp is delivered, the pulp being kept from falling off the receiving end, or rear side of table, by flanges A^2, A^3, as shown. Along the delivery or front side of table is a bead or flange *a*, which rises slightly above the top of table, and over which the concentrates escape into a trough T, or other receiver.

The top surface of the table is transversely corrugated or grooved as indicated at *a*, the corrugations being slightly diagonal, inclining toward the delivery side and end of table, and extending from the rear side to the bead *a*, almost parallel with the line of vibration of table, and at right angles to the course of current of pulp. The corrugations—or small "riffles"—catch the fine and light concentrates, and direct them across the table to delivery side thereof.

The table is vibrated laterally by means of pitmen straps G engaging cranks or eccentrics *f* on a shaft F journaled in uprights of the main frame at the rear side of table.

H is a perforated water pipe suspended above the bead *a*, and connected with a water supply, so that a spray of water can be directed upon the bead at all times.

I is an adjustable "divider," attached to the delivery end of table, near the bead, and adapted to separate the sand and pulp which may work down close to the bead, from the concentrates which work down along the bead.

In operation the table is vibrated laterally, the water and pulp coming from plates or sizer is fed on the table at the upper end A′, and the concentrates being heaviest settle behind the corrugations or "riffles" *a′* and are moved toward the delivery side of the table, and are there thrown over the bead *a* by the rapid vibration of the table, which I propose running at about six hundred vibrations per minute. If the feed is rapid the

delivery side of board is slightly elevated so as to keep the sand and pulp near the rear side of table but the concentrates in the "riffles" are directed toward the bead and separated from the sand. Some of the lighter concentrates will follow down the inclined table near the bead to the tail end of table, and are directed by "divider" into the trough, while the sand is directed away from the trough. The course of the pulp and sand is shown by the full arrows on Fig. 2, and the course of the concentrates by tailless arrows thereon. The table has a double motion, laterally and vertically, which facilitates the separation of the concentrates.

The object of my water pipe H is to deliver a spray of water on the raised side or bead to keep the sand back and to keep the concentrates from packing; for if there was no spray of water on the bead the water from the pulp would stay back farther on the table and concentrates get dry and pack all along the raised bead.

The function of the "divider" is to separate the concentrates from the sand, as by starting up the shaking movement of the machine the concentrates find their way over to the bead and are thrown off but the finest of them and the heavy slimes are forced ahead of the sand, but they being too light to be thrown off at the side will run down along the bead to the lower end of table close to the edge of the bead the sand running down also. By adjusting the movable divider the light concentrates are directed into the box while the sand runs the other way into the waste.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent thereon, is—

1. The combination with the table having a series of diagonally arranged, corrugations or "riffles" and flanges on one end and side only, and a longitudinal "bead" extending along one end of the series of riffles with means for vibrating said table in a direction about lengthwise of the corrugations, and a water jet pipe suspended over the said "bead," substantially as and for the purpose specified.

2. The combination of the table A having a series of diagonally arranged corrugations a', and a longitudinal "bead," a, on one side, and the receiving trough T below the beaded edge of the table with the adjustable supports for said table means for vibrating it laterally, and a pipe for spraying water along the beaded edge of the table, substantially as and for the purpose set forth.

3. The combination of the table, having a series of transverse diagonally arranged "riffles" and also flanges at one end and side to prevent material dropping therefrom; the spring supports of unequal length for the table, the adjustable bars carrying said supports, and the mechanism for vibrating the table laterally, substantially as set forth.

4. The herein described concentrator, consisting of the table A having transverse diagonal corrugations a' upstanding flanges on its head end, and rear side, and a "bead" a on its front edge; the "divider" I attached to the tail end of the table; the spring supports B, B', for the table, the adjustable bar carrying said supports, mechanism for vibrating the table laterally, and the water jet pipe, all substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JACOB LAMPERT.

Witnesses:
FRANK A. STEVENS,
J. GEO. LAMPERT.

[Defendant's Exhibit "I"—Drawings and Specifications of Letters Patent No. 258,879, to A. Blatchly and G. Kustel, Patented June 6, 1882.]

[Endorsed]: District Court of the Fifth Judicial District of Arizona. The Mine and Smelter Supply Co. vs. Arizona Copper Co. In Equity #21A. Defendant's Exhibit "I." Blatchly and Kustel Patent, #258,879. A. M. Parkins, Special Examiner. Filed Nov. 18, 1912. Allan B. Jaynes, Clerk. By Frank E. McCrary, Dep.

No. 2291. U. S. Circuit Court of Appeals for the Ninth Circuit. Defendant's Exhibit "I." Received Aug. 20, 1913. F. D. Monckton, Clerk.

(No Model.) 2 Sheets—Sheet 1.

A. BLATCHLY & G. KUSTEL.

ORE CONCENTRATOR.

No. 258,879. Patented June 6, 1882.

Fig. 1.

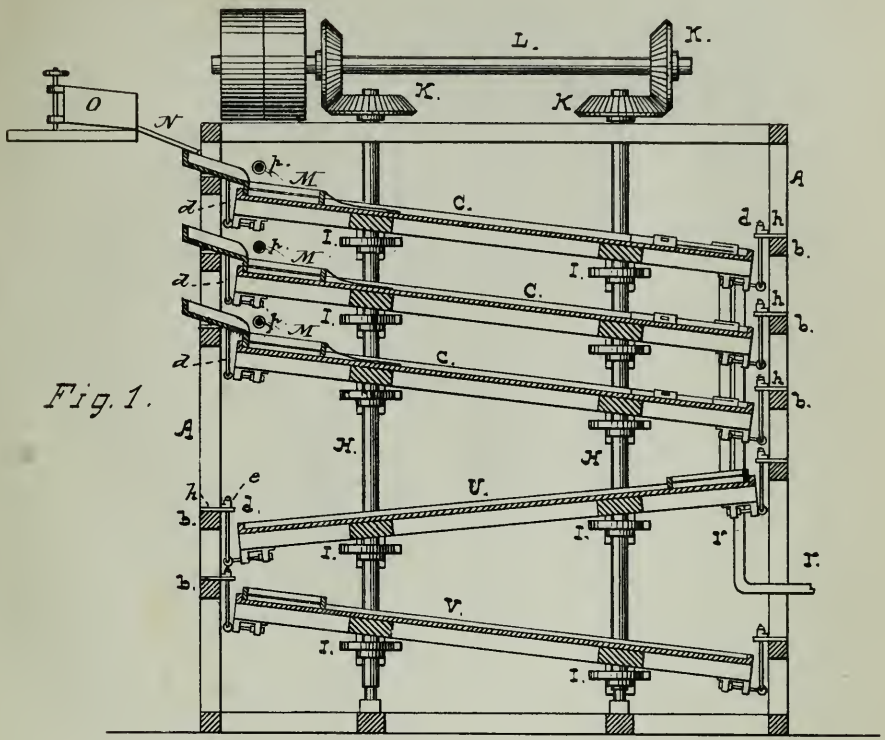
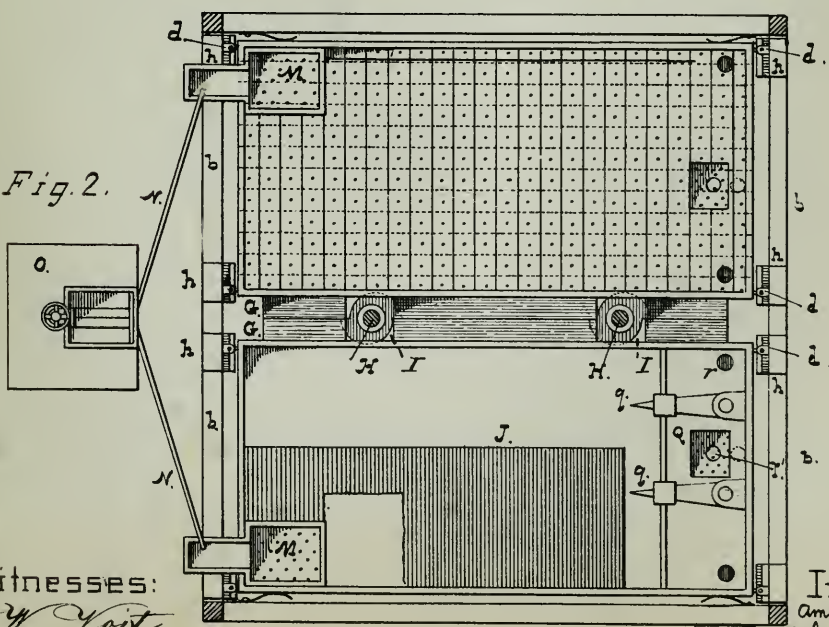


Fig. 2.



Witnesses:
W. Voit
W. F. Clare

Inventors:
Ambrose Blatchly
and Guido Kustel

By their Attys., Dana & Osborn

(No Model.) 2 Sheets—Sheet 2.

A. BLATCHLY & G. KUSTEL.

ORE CONCENTRATOR.

No. 258,879. Patented June 6, 1882.

Fig. 3.

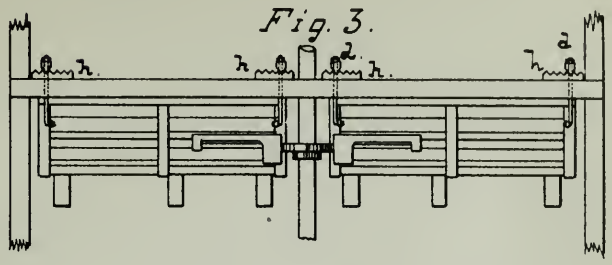


Fig. 4.

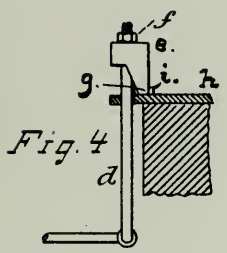


Fig. 5.

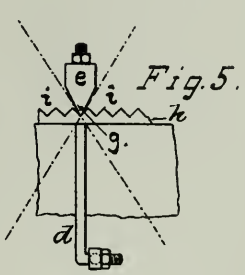


Fig. 6.

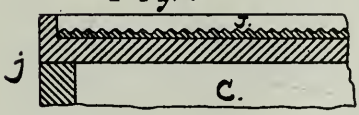
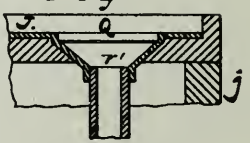


Fig. 7.



Witnesses:
W. Co. Dt.
E. W. Clark.

Inventors:
Ambrose Blatchly
and Guido Kustel
By their Attys., Dame & Dodge

UNITED STATES PATENT OFFICE.

AMBROSE BLATCHLY AND GUIDO KUSTEL, OF SAN FRANCISCO, CAL.

ORE-CONCENTRATOR.

SPECIFICATION forming part of Letters Patent No. 258,879, dated June 6, 1882.

Application filed April 2, 1881. (No model.)

To all whom it may concern:

Be it known that we, AMBROSE BLATCHLY and GUIDO KUSTEL, of the city and county of San Francisco, in the State of California, have invented an Improved Ore-Concentrator; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

Our invention relates to an improved machine for separating the heavy and valuable particles from the light and worthless portion of ore-pulp, sand, and auriferous earth, and at the same time concentrating the heavy particles in a body, so that they can be treated by any of the known gold-saving methods without handling the barren and worthless material.

The objects of the invention are to provide a machine of the above-mentioned character that will perfectly and effectually separate the particles passing over the surface of the tables, and providing the latter with means for separating the pulp or other auriferous material into three or more grades, and, further, separating and concentrating the middlings or second-grade particles. These objects we attain by the construction substantially as shown in the drawings and hereinafter described.

Referring to the accompanying drawings, Figure 1 shows an elevation and longitudinal section. Fig. 2 shows a plan view with the upper set of tables. Fig. 3 shows an end view with a pair of tables. Figs. 4 and 5 are detail views of the hanger from which the tables are suspended. Figs. 6 and 7 are longitudinal sections, showing details of the construction of the tables.

A represents any suitable frame-work, having cross-timbers *b b*, from which the inclined tables C C are suspended. The frame is wide enough to admit of two tables being suspended in it side by side, as represented at Fig. 3. Each table is suspended by rods or hangers *d* at each corner, so that the suspension of each table is independent of the other. We have represented three pairs of inclined tables suspended one above the other; but a single pair could be used. The construction of each table and the arrangement of the pairs are the same, so that we will only describe a single pair.

To provide a bed or table that will not warp or become distorted, we construct each one in the following manner: We make the bottom of each table of a number of narrow and separate strips of wood laid closely together, and arranged in two layers, one layer running longitudinally and the other transversely, so that the grain of one layer crosses that of the other. A wooden pin or metallic nail or screw is then inserted through the center of each cross-layer to secure and bind the strips firmly together. Cross-strips *j j* on the bottom and along the sides and ends serve to give the required stiffness, and a ledge or rim along the sides and ends of the bed completes the table. Upon this bed or floor we place a sheet or layer of india-rubber, J, a portion of the upper surface of which is provided with numerous parallel grooves running transversely across the bed. A quality of india-rubber which is well adapted for this purpose is that which is commonly used for covering the steps of stairs, and which is known as "stair-rubber." The corrugated portion of this rubber surface only extends from the outer rim of the table to the middle, or perhaps a little farther toward the opposite side or rim, leaving a plain smooth surface next to the inner rim.

A slotted plate, *h*, is secured upon the cross-beam *b* of the frame above each corner of the table C, and the hanger-rod *d* passes up through the slot. Each hanger-rod has a block, *e*, secured on its upper end by a nut, *f*. This block has a V-shaped projection, *g*, extending downward from its lower end. The plate *h* on one side of the slot has parallel grooves or notches *i* made on its upper side, in either of which notches the V-shaped projection *g* will enter and ride as the tables swing back and forth. By adjusting these rods or hangers in the notches the tables can be made to strike a harder or lighter blow when they come together, while the nut serves to give vertical adjustment. Bumper-bars G G are secured to the inner edges of the tables C C, opposite each other, so that the bumper-bars of the two tables meet half-way between them.

Two vertical shafts, H H, extend up between

the pairs of tables, one near each end, and on each shaft, directly between each two tables, is a double cam, I, which forces the two tables apart laterally as the shafts rotate, and then releases them, so that they drop back against each other with a concussion or jar. The shafts H H are driven in a reverse direction by bevel-gears K K from a driving-shaft, L, above the frame-work, so that their cams act upon the two tables of each pair simultaneously, and the friction or thrust of one is counteracted by that of the other.

In the upper outside corner of each table we secure a pan, M, the bottom of which is a screen, and the pulp is fed to the screen-pan of each pair of tables by divergent spouts N N, which lead from a hopper, O, into which the pulp is shoveled or otherwise deposited. The bottom of this hopper is made inclining from its middle in each direction, so that the pulp is equally divided and distributed to the two tables. The pan-screens are secured to the tables, so that they receive the same motion and jar that the tables receive, and this sifts the pulp through upon the upper outside corners of the concentrating-surfaces. A perforated water-pipe, *p*, passes across the upper ends of the tables, through the perforations of which jets of clear water are ejected upon the upper end of the tables. The pulp, when thus sifted upon the upper outside corner of the concentrating-surface, will begin to flow down toward its lower end; but the constant motion and concussion or jar will cause the heavier particles to separate and settle to the bottoms of the corrugations and be carried by the concussion directly across the table to the smooth surface, over which they will move in a diagonal direction to the lower corner of the table. The angle which the particles will take on moving across the smooth inclined surface will be greater or less according to their specific gravity, because the heavier the particles the more sensitive will they be to the concussion or jar, while the lighter particles, being less sensitive, will move down the incline in a more nearly direct line.

At the lower end of each table we secure two adjustable dividers, *q q*, the outer ends of which can be adjusted toward either side of the table, so as to divide the moving stratum of pulp into three grades. That which moves down into the space between the outer edge of the table and outer divider will be entirely worthless, while that which travels across the rubber surface to the inner side of the table and enters the space between the inner edge of the table and inner divider will be composed of the heaviest and most valuable particles. These latter particles are conducted through a pipe, *r*, directly to a receptacle where the concentrations are collected, while the worthless portions in the opposite corner are run to waste. This leaves only the middlings which are contained between the two dividers to be disposed of. These middlings consist of small particles of sulphurets and the large and heavy particles of worthless matter that do not become separated in passing over the surface. The very coarse particles contained in this grade will be worthless, because, if they were valuable, their weight would have carried them into the inner compartment. Hence we mount a screen, Q, over an opening, *r'*, in the table between the dividers, so that the fine particles will pass through the screen and down through the table, and fall upon the table below, while the large particles that pass over the screen enter an opening behind the screen and are carried to waste.

If we use two or more series of parallel inclined tables, the middlings of the upper tables will fall into the middlings-departments of the tables below successively, and, finally, the middlings of all the parallel series will fall upon the upper end of an oppositely-inclined pair of tables, U, below the upper series. On these tables the middlings are again subjected to the concentrating action of the lateral vibration and jar, and they fall from the lower ends of these tables upon another oppositely-inclined pair of tables, V, so that by the time they pass over both these lower tables the concentration will be complete.

The principal feature of our invention is the new mode of operation, consisting in sorting and grading the particles upon the concentrating-surface, and then conducting only the mixed grade to other tables for further separation, so that clean sulphurets are obtained from the first tables, and the remaining series of tables only separate and concentrate the unseparated and unconcentrated particles. This method insures a complete separation and concentration of the particles without any additional handling, the particles being automatically collected and directed to, upon, and over the successive tables.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an ore-concentrating machine, the two suspended tables C C, mounted in the same plane and provided with bumpers G G, in combination with one or more upright shafts, H, arranged between said tables and provided with cams I, substantially as and for the purpose specified.

2. In a swinging concentrating-table, C, the rod-hangers *d*, each of which is provided with an adjustable block, *e*, and a V-shaped projection, *g*, in combination with the slotted supporting-plate *h*, with its notched upper surface, substantially as and for the purpose described.

3. In a laterally-shaking concentrating-table, the india-rubber surface, one portion of which is corrugated, while the remainder is plain, substantially as described.

4. In an ore-concentrating machine, a series of inclined tables suspended in pairs, side by

side, in combination with mechanism for producing an outward motion, substantially as shown and described, said tables being provided with a partially-corrugated and a partially-plain surface, and having at their lower ends dividers *q q* and screen Q, substantially as and for the purpose specified.

In witness whereof we have hereunto set our hands and seals.

AMBROSE BLATCHLY. [L. S.]
GUIDO KUSTEL. [L. S.]

Witnesses:
B. J. BURNS,
H. KUSTEL.

[Certificate of Clerk U. S. District Court to Supplemental Record.]

United States of America,
District of Arizona,—ss.

I, Allan B. Jaynes, Clerk of the United States District Court for the District of Arizona, do hereby certify that the attached exhibits, being Defendant's Exhibits "A," "B," "C," "D," "E," "F," "G," "H," "I," constitute and are the original exhibits of the defendants in the cases of Mine and Smelter Supply Company, a corporation, Plaintiff, vs. Detroit Copper Mining Company, of Arizona, a corporation, Defendant, and Mine and Smelter Supply Company, a corporation, Plaintiff, vs. Arizona Copper Mining Company, a corporation, Defendant, No. 11 and No. 12, respectively in said Court, as the same appear from the original records of the same remaining in my office.

And I further certify that the above and foregoing constitute true and complete supplemental transcript of the record in said cause, being the defendant's exhibits omitted from the original transcript.

Witness my hand and the seal of said Court affixed at Phoenix in the District of Arizona this 16th day of August, 1913.

[Seal] ALLAN B. JAYNES,
Clerk.

[Endorsed]: No. 2291. United States Circuit Court of Appeals for the Ninth Circuit. Detroit Copper Mining Company of Arizona, a Corporation, Appellant, vs. The Mine and Smelter Supply Company, a Corporation, Appellee, and Arizona Copper Company, a Corporation, Appellant, vs. The Mine and Smelter Supply Company, a Corporation, Appellee. Supplemental Transcript of Record. [Defendant's Original Exhibits "A," "B," "C," "D," "E," "F," "G," "H" and "I."] Upon Appeal from the United States District Court for the District of Arizona.

Received August 20, 1913.

FRANK D. MONCKTON,
Clerk of the United States Circuit Court of Appeals for the Ninth Circuit.

By Meredith Sawyer,
Deputy Clerk.

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150 to 155 Review of the case.

UNITED STATES CIRCUIT COURT OF APPEALS

FOR THE

NINTH CIRCUIT

The Detroit Copper Mining Company of Arizona,
a Corporation,

and

The Arizona Copper Company, a Corporation,

Defendants-appellants,

vs.

The Mine and Smelter Supply Company,
a Corporation,

Complainant-appellee.

Appeal from the District Court of the
United States for the District
of Arizona

No. 2291.

BRIEF FOR THE APPELLANTS

This is an appeal from the District Court for the district of Arizona. The plaintiff below, the Mine and Smelter Supply Company, brought the suit in the first place against the defendants below—The Detroit Copper Mining Company of Arizona, and the Arizona Copper Company, in the Territorial Court of Arizona before its admission as state. Upon the erection of the territory into a state and the creation of a District

Court for it the cases were transferred to that court. The suit is for alleged infringement of U. S. patent 590, 675, to Arthur R. Wilfley, dated September 28, 1897, for improvement in ore concentrators. The defense is non-infringement.

The proceedings extended to great length, covering a wide field. The testimony on the part of the plaintiff consisted chiefly of depositions of experts. They related to the structure and operation of the machine, the construction and application of the claims of the patent, and the place and scope of the invention in the art. The whole controversy related to a single feature of the patented machine—to the deck, or top surface upon which the process of concentration goes on. In the presentation of its case in proof and argument the plaintiff assumed as a proper embodiment of the invention a form and configuration of deck, which, while not excluded by the terms of the patent, was not within its preferred form as described in the specification. Further remark upon this point will fit in more appropriately at a later period in the discussion. On this small foundation the case dragged its slow, interminable length along for three years, after the fashion of patent cases under the old equity pratice. It was submitted for final hearing November 18, 1912, and judgment entered for the plaintiff January 14, 1913.

The defendants were copper mining companies and used in their business a form of ore concentrator manufactured by the Deister Concentrator Company at Fort Wayne, Indiana. There was no dispute, there-

fore, about the use by the defendants of the machine which was alleged by the plaintiff to infringe its patent. While there were two separate parties defendant, the suits were by the same plaintiff for infringement of the same claims of the same patent by use of the same machines. Both defendants appealed on the same grounds. So by stipulation of counsel the appeals were docketed in this court as a single case; which it is hoped the court will approve.

Counsel are not able to state the errors relied on more concisely than in the terms of the assignment of errors stated in the prayer for appeal as follows:

ASSIGNMENT OF ERRORS

1. The court erred in holding that the Deister Concentrating Table No. 2, the machine which was the subject of the litigation, was an infringement of the patent in suit.

2. The court erred in holding that the low and diagonally deflected riffles on the said Deister Concentrator No. 2 were an essential feature of said Deister Concentrator.

3. The court erred in holding that the diagonal deflection of the ends of the riffles on the Deister Concentrator was the mechanical equivalent of the advancing terminal arrangement of the riffles on the Wilfley table.

4. The court erred in its construction of the claims of the Wilfley patent in suit.

5. The court erred in holding that it was a want of foresight in Wilfley to limit his claims as he did.

6. The court erred in holding that in view of the history and importance of the Wilfley patent in suit it should be construed, notwithstanding the language used by the inventor as covering the appropriation of this essential feature of the Wilfley table.

7. The court erred in denying the defendant's petition for rehearing.

8. The court erred in rendering judgment for the plaintiff.

The adequate argument of the questions presented in the record will cover a wide field and occupy much space and involve the citation of many authorities, which, however, can be presented intelligibly only after the elaboration of the propositions to which they relate. What we have now said is intended as the best compliance within our power with subdivisions (a), (b), and (c) of rule 24 to the point at which we may take up the argument, beginning with a description of the structures to be considered.

An ore concentrator is a machine for separating finely comminuted particles of metal from waste material mingled with it also finely comminuted. The comminution is commonly the result of grinding. The ore is found in streaks, veins and masses of varying size embedded in the solid rock. The rock is first broken up and the pieces that are rich enough in metal to go direct to the smelter are sent there. But after all that will do to go to the smelter in the lump has been disposed of a residue remains too poor in metal for that treatment, and that is ground in water into the form of "pulp" and sent to the concentrating

table. The percentage of the total output of the mine which has to be recovered in this way may be as much as thirty per cent. and more.

The field is an attractive one to inventors, and many patents have been isued for ore concentrators. There have been a few adjudications upon such patents in the district courts, but this is the first time within our knowledge that one of them has come before a United States Circuit Court of Appeals.

All concentrators of the type of the two here in controversy contain two elements in combination—a reciprocating movement, and a concentrating surface which is usually a combination of riffles and smooth space. The reciprocating movement is a minute form of oscillation not found in any other machine so far as we know. It is not necessary to describe the mechanism by which it is produced. There are numerous forms of it in use. It will be sufficient to describe the movement itself. It is a minute to and fro motion which, starting from a state of rest, begins slowly, accelerates to a maximum, then stops suddenly and returns relatively slowly. Its utility consists in the effect which it has to drive forward particles of mineral or grains of sand resting on the surface of the table. They move forward with the table in its slow initial motion without disturbance and are not disturbed by the gradual acceleration of that motion. But when the sudden stop comes they make a quick slip forward on the surface of the table. It is as though the table were jerked from under them, as it is, in fact.

These oscillations are very rapid—two or three

hundred in a minute. Solid particles on the table move along with an almost continuous motion. An important point to be noted is that if a grain of sand and a particle of metal start side by side on a table having this reciprocating movement the metallic particle will run away from the grain of sand. This is because the metallic particle, being of greater specific gravity, accumulates more momentum during the forward movement, and so travels further on the sudden stop. The beautiful way in which this reciprocating movement co-operates with the riffles on a concentrating table to push the material along between them will be explained a little later.

It will contribute to clearness to notice the extreme narrowness of the issue to be decided. In the bill of complaint infringement of the patent sued on is charged in restricted terms. In paragraph VIII of the bill, after reciting the purchase by the defendant of twelve concentrators from the Deister Concentrator Co., the pleading proceeds as follows:

> "And thereafter the same were delivered and installed in a mill owned and operated by said defendant at Morenci, Graham County, Territory of Arizona, and thereafter the same were used, and continuously ever since and still are being used in the concentration of ores by said defendant at the place aforesaid, with certain riffles upon the tops or concentrating surfaces thereof, which in their construction, adjustment and arrangement upon said table surfaces substantially embody and contain the improvements and invention so patented to said Arthur R. Wilfley as aforesaid by said hereinbefore described Letters Patent No.

> 590,675, now owned by your orator as aforesaid, and especially the improvements covered and protected by the first, second and seventh claims of said Letters Patent."

The answer of the defendant contains no denial of the validity of the patent sued on and no denial except this in paragraph V:

> "And denies that it has ever used or is using any ore concentrators, or ore concentrating tables with riffles upon the tops or concentrating surfaces thereof, which, in their construction, adjustment and arrangement upon said table surfaces substantially embody and contain the improvements and invention so patented to said Arthur R. Wilfley by said patent 590,675, or infringe the first, second and seventh claims of said patent, or any of them, or any of its claims."

Paragraph VI of the answer is in these words:

> "And said Defendant answering further, says that the art of making and using ore concentrators and ore concentrating tables was an old and well known art, and such concentrators and concentrating tables had been made and patented and used in many forms before the said Arthur R. Wilfley made the inventions or produced the apparatus described in said patent 590,675, and in support of this averment and to show the state of the prior art defendant will offer in evidence to be read at the final hearing the following United States patents; and if others shall come to its knowledge before the final hearing, it will ask leave to incorporate them into this answer by amendment or notice."

Followed by a list of twenty-one prior patents.

The sole issue made by the pleadings is, there-

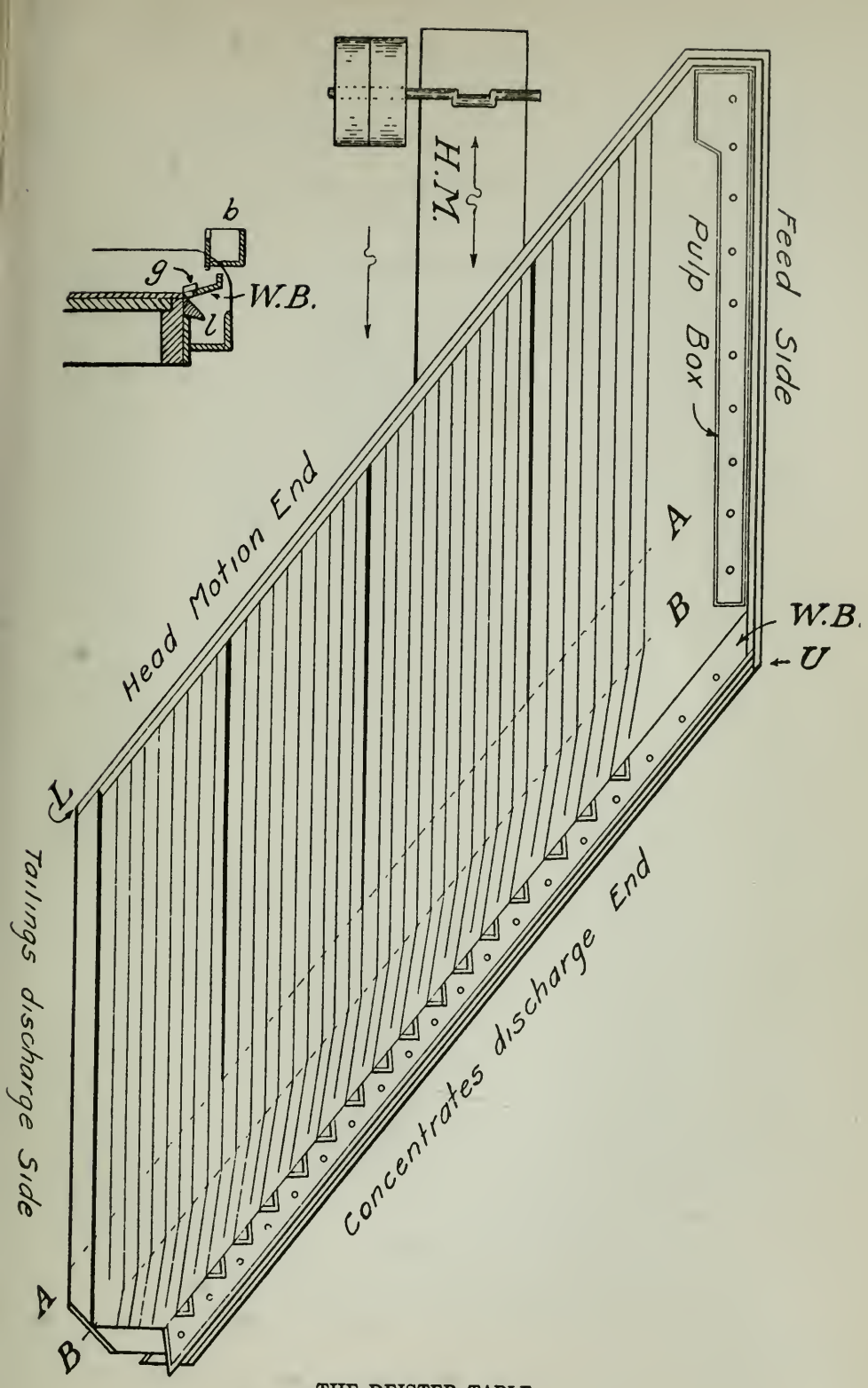
fore whether or no the riffles on the top, or concentrating surface of the Deister table in their "construction, adjustment and arrangement upon said table surface substantially embody and contain the improvements and invention so patented to said Arthur R. Wilfley." This limits the issue to the configuration upon the surfaces of the two tables. At the hearing in the District court we opened our argument by handing up to the court two printed reproductions of drawings, one showing Fig. 3, of the Wilfley patent and the other the deck of the Deister table. We will do the same thing now by inserting here the same two cuts. A look at these discloses the whole issue to be tried.

As the plaintiff's case rests on claims 1, 2 and 7 of the patent, and as those claims relate wholly to Fig. 3, and to the configuration of the deck of the table shown in Fig. 3, the case stands as though all the invention covered by the patent were the configuration of the deck of the table shown in Fig. 3, and the only claims in it were those numbered 1, 2 and 7. One would say, therefore, that it ought to present an easy case to try. Counsel for the appellant are optimistic enough to believe that the court will find it so.

Coming now to the argument of the questions to be decided, it seems to us that a convenient way to proceed will be to describe the construction and operation of the two tables in order—the Wilfley first and then the Deister.

THE WILFLEY TABLE

For this description reference will be made to the



THE DEISTER TABLE

(No Model.) 2 Sheets—Sheet 2

A. R. WILFLEY.

ORE CONCENTRATOR.

No. 590,675. Patented Sept. 28, 1897.

FIG. 3.

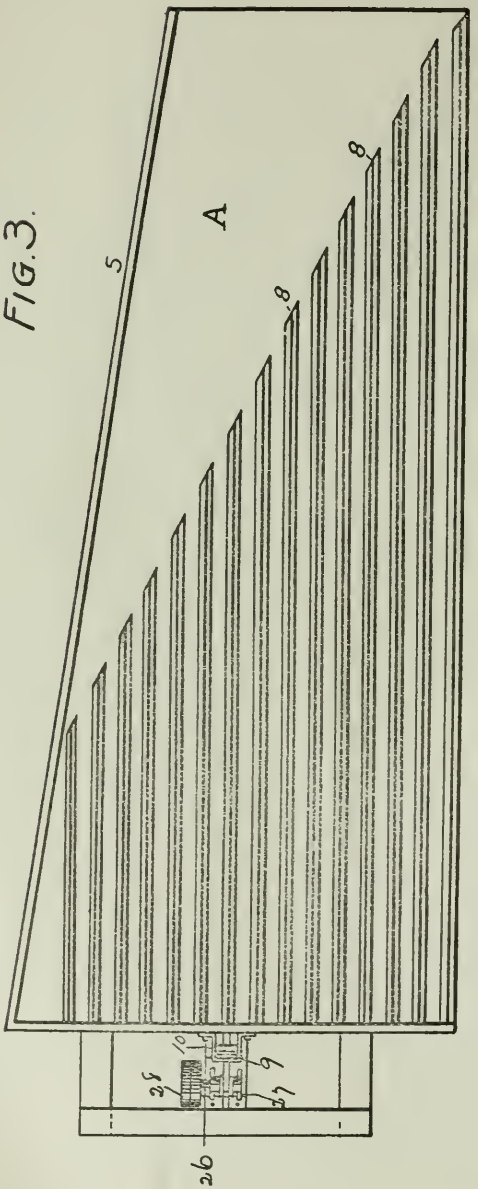
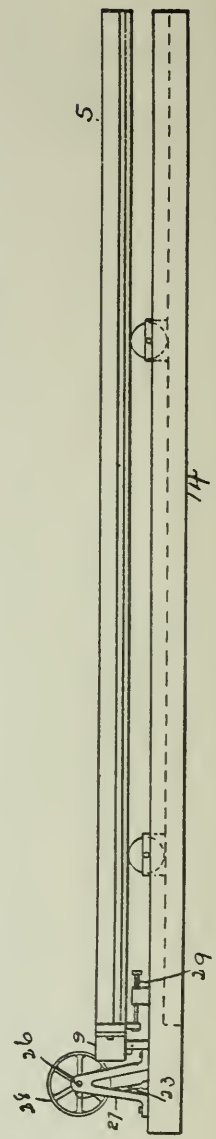


FIG. 4.



Witnesses
[illegible]
Edith Hinsworth

Inventor
A. R. Wilfley
By his Attorney
A. R. Wilfley

reproduction of Fig. 3, on the last page. In looking at the picture the page is to be so held that the broader end of the table shall be at the left. What is shown here, it will be remembered, is only the deck of the table with a portion of the mechanism which produces the reciprocating movement projecting from under. This mechanism is commonly called the "head motion" and that end of the table the head motion end. It is also distinguished in this case as the head of the table, and the narrow end at the right the foot.

The entire surface of the deck is first covered with linoleum. Upon a portion of it is then placed a group of riffles 8 8, leaving the remainder occupied by the triangular smooth space A. The riffles are of unequal length, the upper one being the shortest, and the others increasing progressively in length to the lowest, which extends the whole length of the table. The table is transversely inclined; that is, there is a uniform slope across the table from the upper and shortest riffle to the lower and longest one. A pulp box not shown in the drawing is located at the uppermost corner where a small vacant triangular space appears. This composition is about the consistency of chicken gravy and flows by gravity down across the rifles. Extending from the end of the pulp box to the foot of the table along its upper edge is a water supply from a perforated pipe or other device which floods the space A and the riffles below it at all times when the table is in operation.

The valuable constituent of the pulp is in form of fine particles of mineral mixed with a much greater

bulk of sand formed from the ground stone. The particles of metal are heavier than the sand. There is, therefore, a tendency to stratification in the mixture —the metal in the bottom and the sand above it. This tendency is greatly increased by the jarring effect of the reciprocating movements. The riffle troughs, or spaces between the riffles, act as reservoirs to hold the pulp momentarily as it passes. Thus the upper trough is filled first by flow from the pulp box and the pulp which fills it pauses an instant on its way. In that instant some of the metallic particles which are constantly tending to gravitate downward reach the bottom of the trough. That troughful of pulp, however, is immediately crowded out by the mass that follows it into the next trough, and then the next, and so on down, each troughful of pulp leaving a little mineral in the trough as it goes, until by the time it reaches the last one the mineral is all out of the pulp, leaving the gangue or worthless constituents to go over the lower side of the table as waste.

In the meantime, while this has been going on the material between the riffles has been moving toward their terminals under the impulses of the longitudinal reciprocating movement of the table. The riffles taper from the head motion end of the table at the left to their tips. Consequently the troughs between them grow shallower, exposing the material in them to the cross flow of water from the upper edge of the table with progressively increasing effect. The relatively greater specific gravity of the mineral particles tends to keep them at the bottom of the trough, and the sand

on top, where it is sheared off as the stratified mass moves along the troughs from their deeper to their shallower portions. Of course, this process is destributed from riffle to riffle as the pulp moves across them. Some particles of mineral are left in each trough and some go over with the pulp into the next trough where some more mineral is left, the pulp losing some mineral in each trough it crosses until, by the time it reaches the last one, nothing of value is left. It is apparent that if the taper of the riffles continues until they are very low—say 1-16th or 1-32nd of an inch in height, as it commonly does, the water flowing across them will shear off, first, the coarse sand, then the finer grains, until there will be little left in them except particles of mineral, and that little very fine sand. At this stage the mineral particles mixed with fine sand, emerge from the ends of the troughs at the riffles tips upon the smooth space A. There they encounter two forces acting in different directions. The reciprocating movement, if no other force were present, would impel both mineral and sand straight on in the lines of the rifle troughs produced to the foot of the table. The force of gravity and the flow of the water combined, if no other force were present, would sweep them down across the space A to the riffle terminals again. The controlling force is a resultant of these two, under the influence of which the particles tend to take diagonal paths across the space A. And here a certain assorting process goes on. The heaviest particles being most responsive to the reciprocating movement, follow lines

higher up on the space A and go off the table into the concentrates box at the foot at points nearer to the upper corner, while the lighter ones take lower paths, and leave at points lower down. In the perfect operation of the table the mineral should all leave it at the foot. There is a critical point, however, at the lower right-hand corner where some mineral that ought to go into the concentrates box will sometimes slip around the corner and get mixed with the gangue, or some gangue will slip around and get into the concentrates box. Provision is commonly made for this contingency by placing a receptable at the corner to catch this mixed product called middlings, which is then retreated.

This combination of rifles increasing in length progressively from the shortest at the upper edge of the table to the longest at the lower edge, with a smooth, plain, or unriffled space adjoining their terminals, constitutes the novel and characteristic feature of the table, and the process of washing the sand from the concentrates as the material emerges from the riffle troughs was the subject of much testimony and argument in the court below. The fairest way to describe that process will be to do it in the words of the patentee, and for that purpose we insert the following extract from the specification of the patent—page 2, lines 7 to 56: (Rec. p. 299)

> All the mineral, together with a portion of the gangue, is first caught by the riffles, and under the influence of the table's motion is carried longitudinally toward the foot of the table until it reaches the smooth, unriffled

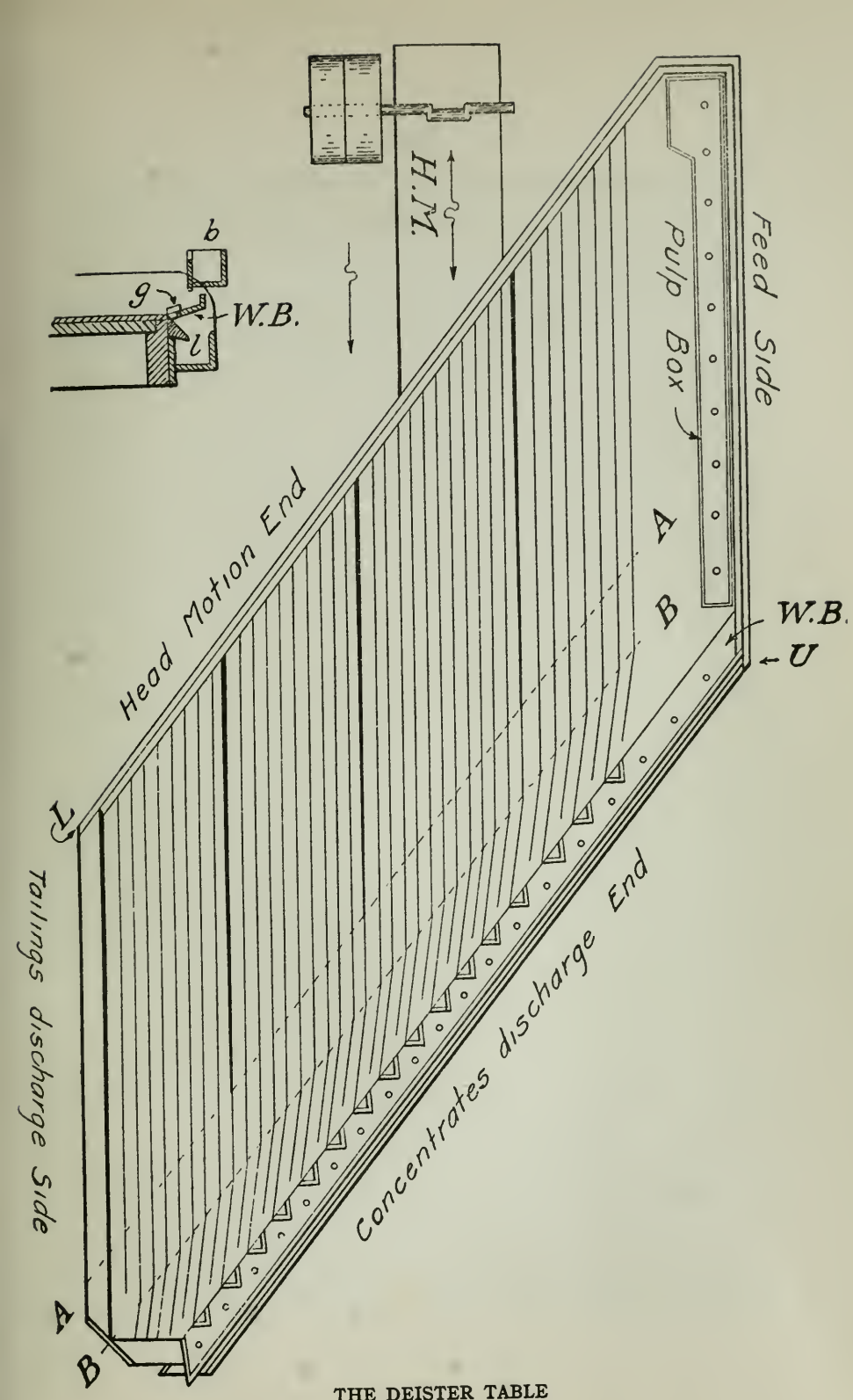
portion A of the table, where it is acted on by the water, which effects a perfect or approximately perfect separation of the gangue from the mineral. As the material caught by the uppermost and shortest riffle passes to the portion A of the table the action of the water, which is fed to the upper edge of the tables, carries the gangue downward to the next riffle, while the mineral remains on the smooth portion A and is carried toward the tail of the table, where it is finally discharged. It is expected that some of the mineral caught by the uppermost and shortest riffle will be carried downward with the gangue to the next riffle, which is longer. After leaving this last-named riffle and passing to the smooth or unriffled portion of the table the water again acts on the material and carries the gangue downward to the next riffle, leaving the clean mineral on the smooth portion A of the table. If any of the mineral escapes with the gangue the second time, it will be caught by the riffle next below and again subjected to the separating action of the water as soon as it reaches the smooth portion A of the table. In this manner the material is carried transversely downward and longitudinally forward, the gangue being discharged at the lower edge of the table completely impoverished of its mineral values, while the latter are discharged at the foot or tail of the table. A portion of the gangue—that is to say, the lighter part thereof—passes over each riffle in succession from the shortest or uppermost to the longest or lowermost riffle. The mineral and the heavier gangue are caught by the riffles and finally separated on the smooth portion A of the table. This combination, in a concentrating table, of riffles of varying length for catching the mineral and a smooth, plain, or unriffled portion at the extremities of the

riffles, where the final separation is effected through the action of the water, is believed to be entirely new in an apparatus of this class.

THE DEISTER TABLE

For convenience of reference we insert again in connection with this description the same cut of the Deister Table shown on an earlier page. This cut is a picture of the deck of the Deister concentrator which was in use by the defendant companies in their concentrating mills at Morenci when this suit was brought. It is, therefore, the very subject of the controversy here. Was the use of it an infringement of the Wilfley patent? The first step toward an answer to that question will be to describe the construction and operation of the table.

The table top, or deck, is a plane surface provided with riffles extending across its narrower dimension from the "head motion end" to the "concentrates discharge end." One would think he should say from the head motion side to the concentrates discharge side. But patent solicitors and mine men have a habit of calling the opposite edges of a concentrating table in which the riffles begin and terminate the ends of the table, whether that distance be the longer or shorter dimension of the table. The part marked H. M. is the actuating member of the mechanism by which the vibrating movement is imparted to the table, and goes by the name of the "head motion." The riffles are divided into four groups by riffles of greater height than the others, which are shown in the drawing in



THE DEISTER TABLE

heavy, black, tapering lines. These high riffles diminish in elevation from the head motion end to the line A A, along which line all the riffles are of the same elevation above the deck of the table. At that line they all drop off a little and equally in elevation. This may be 1-16th of an inch. From that line they all continue at the same elevation to the line B B, at which line they all drop off again in elevation to 1-32nd of an inch, at which height they continue to their terminals. In the space or zone lying between the line B B and the concentrates discharge line the riffles are slightly deflected toward the tailings discharge side of the table. At the feed side is shown the pulp box. This is raised slightly above the surface of the table, so that pulp flowing through the holes which are shown in it will spread over the unriffled space adjacent to the feed side. The pulp is fed from a spout discharging into the enlarged portion of the pulp box. With the assistance of the vibratory motion of the table the pulp tends to flow along the pulp box and out through the holes in it and spread over the unriffled surface below it. The table slopes generally from the feed side to the tailings discharge side, so that the pulp travels across the riffles leaving its valuable grains of metal between them as it goes until it falls off at the tailings discharge side as waste.

But this general declivity of surface is qualified by minor inequalities of elevation which play an important part in the operation of the table. When in operation the corner U is the highest point on the table, and the corner L the lowest. From its head motion

end to its concentrates discharge end the whole table has a slight slope upward. The vibratory movement causes the particles of metal to creep across the table along the riffle troughs. This movement is imparted by the projecting member marked H. M. The double-headed arrow is to indicate that the movement of that member is to and fro; the single-headed arrow is to indicate the direction of the resulting movement of the metallic particles along the riffle troughs. It would appear from this that the metallic particles are driven uphill as they creep along the riffle troughs, which is the fact, and an important fact, as we shall see.

We can now picture to ourselves the action of the table in operation. It is covered with pulp flowing across the riffles from the pulp box to the tailings discharge with a sort of tremulus movement caused by the vibrations of the table. As it goes the heavy particles of metal gravitate to the bottoms of the riffle troughs until, when it reaches the tailings discharge, they have all dropped out, and under the impelling force of the vibrating movement are creeping along the riffle troughs toward the concentrates discharge end. This is a continuous process going on hour after hour all day long.

But there other features of construction to be attended to which improve it still further. The high riffles have a utility not yet mentioned. They form dams across the table, above which pools are created which flood the riffles above them for some distance —something like half way to the next high riffle

above. In these pools the particles of metal have a little more time to settle than they would have if the high riffles were not there. As they pass out of them they are pushed along the riffle troughs by the vibratory movements toward the concentrates discharge. At the line of that discharge there is a supplementary device, known as the washboard, and designated by the letters W B in the drawing. This is a board set snugly against the edge of the table, with a sharp slope toward it, over which a film of water is kept flowing at all times when the table is in operation. The relations of the parts here are shown in detail in the little figure at the left. The letters W B again denote the washboard, which is seen fitted tightly against the edge of the table and sloping toward it. At *b* is a water box, which is kept filled so that water runs over by the notch in its upper edge and drops on the washboard to spread out over its surface in a thin film. At *g* is a little V-shaped guard fastened on the washboard, through the enclosed angle of which is a hole through the washboard, below which is a spout leading to the trough *l*. The concentrates leave the table through that hole, to be stored in the trough *l*. In the washboard W B of the main figure may be seen the same triangular guards shown at *g* in the small figure.

It will be seen that at the concentrates discharge end each alternate riffle is a little shorter than the one below it. The hole in the angle of the guard *g* on the washboard registers with the terminal of the longer riffle, so that the concentrates which come by the

trough alongside that riffle, drop through that aperture into the concentrates box. Just before leaving the table they are joined by the concentrates which came by the next trough above, so that each aperture receives the concentrates from two riffle troughs. When the concentrates from these two troughs reach this little space at the end of the short riffle they are met by the film of water flowing down the washboard, which washes out the last unseparated grains of sand which remain with them, leaving the clean metallic particles to go into the concentrates box.

The water which comes from the washboard serves also another useful function besides this final washing up of the concentrates. It has been stated that when the table is in operation the corner U is the highest point on it, and the corner L the lowest. From this fact, water flowing over the table will tend to cross the riffles nearly at right angles to them. This applies to all the water coming from the washboard. The water, in the first place, replenishes the pools formed above the high riffles, and in the diluted fluid thus produced the metallic particles settle more readily to the bottoms of the troughs, to be pushed on alon g them, as heretofore described. In the next place, that flow of water across the comparatively low riffles in the zones between the lines A A and B B, and B B and the concentrates discharge outlets operates to wash the sand remaining in them at the last minute down to the tailings discharge.

The Deister table came into the field long after the issue of the Wilfley patent, and is claimed to repre-

sent a large advance in the art. At the time this suit was begun it had not been patented. The court will want to understand its construction and operation as perfectly as possible. We will add to the general description just given a reference to three points which are specially deserving of notice. The first of these is the high riffles already mentioned. The function which they perform of creating pools above them which flood the riffles about half way to the next riffle above is a unique and valuable feature of the table. It is by a process of stratification that all concentrating tables work. If the mineral would not settle in the bottom of the riffle trough it might flow over a hundred of them and come off at the foot in the same condition in which it started. This stratification is greatly accelerated by dilution. If a man would put a pint of pulp and two quarts of water in a pan and shake it a few minutes with his hands, then pour off the top and put in more water, he would by and by have the mineral in the bottom of the pan. This is the method by which the forty-niners gathered gold from the sands and gravel in California. The modern ore concentrator is only an evolution from the forty-niner's pan.

The pulp flowing down the Deister table stops only for an instant in the pools above the high riffles. But for that instant the process of stratification goes on more rapidly than it would go if the pool were not there. In its passage from the head to the foot of the table it crosses about sixteen of these riffle trough pools. This dilution in connection with the jarring produced

by the reciprocating movement with its 250 vibrations per minute makes the mineral particles tumble down fast. There are no such pools as these on the Wilfley table.

In the next place it will be observed that on the Deister table the riffles in the division above the first high riffle are further apart than those in the divisions below it. They are also higher. When the pulp first emerges upon the table from the feed box it is rich in mineral. It begins to stratify at once, and concentration goes on rapidly. The fine particles of mineral cannot climb over the high riffles, but the coarser grains of sand can. The riffles in that group are specially adapted to the condition of the pulp at its first entrance on the table. We shall exhibit later proof of this fact in tests of the Deister table which show that substantially half of all the mineral recovered on the table comes from the first group of riffles. The pulp which goes over the first high riffle to be concentrated in the second group is comparatively poor stuff; that which reaches the third group poorer yet, and that which crosses the fourth group is poverty stricken.

Finally, a word further in relation to the low riffles in the zone between the line B B and the concentrates discharge. By the time the material reaches that zone the coarse sand has all gone over the riffles and down to the tailings discharge. But there remains a residue of every fine sand which it is difficult to separate from the mineral. It will go over riffles if they are low enough, but they must be very low. The

mineral particles mixed with it will also go over the riffles if they are low enough. The problem is to provide riffles low enough to let the fine sand go over, and at the same time high enough to keep the concentrates back. Mr. Deister found that as a rule one thirty-second of an inch would meet those conditions. But there is no magic in that exact figure. They might be a sixty-fourth of an inch higher and work well. And with pulp of relatively coarse quality a sixteenth of an inch will be best.

The deflection of the low riffles is for this purpose: In that zone the material is subject to two forces acting in different directions—one the force of the reciprocating movement, which tends to impel the material straight on to the concentrates discharge; the other the force of gravity and the flow of the water coming from the washboard which tends to carry the material down toward the foot of the table. The resultant of these forces is along a slightly deflected line across the zone between the line B B and the concentrates discharge.

And so by accommodating the riffles in that zone to that line it becomes a little easier to let the sand over and hold the concentrates back. This feature is the last refinement of construction in the most highly developed table in the art at the time it came out, every square inch of which does perfect work. But the deflected position of the low riffles is not a fundamental, nor even an important feature of the table. The riffles could keep straight on to the concentrates discharge without substantial change in the operation of the table.

After this description and comparison of the con-

struction and operation of the two tables as respects their decks it will be in order to take up for consideration the patent in suit.

THE WILFLEY PATENT

This patent was the foundation of the suits from which this appeal was taken. The sole question to be decided here, in a final sense, is whether or no the Deister table is an infringement of it. We wish to present a minute and careful discussion of it, which we cannot do unless it is first read by the court. There is a copy of it in the record at page 299, but it will be such an inconvenience to the court to follow in this brief the references which we wish to make to the patent, and compare them with the copy in the record, that we beg to leave to append hereto as an exhibit a zincograph cut of the patent which we have had made for the purpose to fit the brief.

Referring now to the patent, the first point to notice is that the solicitor who drafted it went to a world of trouble to make it plain. Its distinguishing feature is its combination of a group of riffles of progressively increasing length with an unriffled area adjoining their terminals. The repetition of adjectives used to describe this simple combination is something wonderful. For example, on page 2, line 21, it says "smooth portion A"; in line 28, it says "smooth or unriffled portion"; in lines 31, 36 and 48, it says "smooth portion A"; in lines 51-2 it says "a smooth, plain, or unriffled portion at the extremities of the riffles." Then when it comes to the claims he uses in

the first one the words "smooth, plain, or unriffled portion extending from the extremities of the riffles toward the tail of the table," and in each of the six other claims the words, "plain or unriffled portion". All this verbiage is to describe Fig. 3 of the patent. It means that one portion of the table is riffled and the other unriffled, or without riffles. Either of the three words, smooth, plain, or unriffled, would describe the unriffled portion A distinctly enough. Reading the language in connection with the drawing, as we are bound to do, it is as clear as words and drawings can make anything that the unriffled portion is a *single space adjoining the terminals of all the riffles.*

With this clean cut combination in mind we are ready to take up the subject of infringement. The first, second and seventh claims are the only ones of which infringement is alleged, and are in these words:

> "1. A transversely inclined concentrating table having a movement whose tendency is to carry the material longitudinally forward toward the tail or foot of the table, said table being provided with a number of riffles extending longitudinally a portion of the distance from its head toward its foot, said riffles varying in length for the purpose specified, the table having a smooth, plain, or unriffled portion extending from the extremities of the riffles toward the tail of the table, whereby the material as it leaves the riffles is subjected to the action of the water on the smooth portion of the table and the final separation of the mineral from the gangue effected."
>
> "2. A transversely-inclined concentrating-table having a number of longitudinal riffles extending a portion of the table's length from

the head toward the foot, said riffles being of unequal length, the uppermost being the shortest while the other riffles increase in length from the upper edge to the lower edge of the table, the table having a plain or unriffled portion lying at the extremities of the riffles and adapted to receive the material caught by the riffles."

"7. The combination of a transversely-inclined concentrating-table having a series of riffles extending longitudinally from the head toward the tail of the table, said riffles being of unequal length, the uppermost being the shortest and the riffles increasing in length from the upper to the lower edge of the table, the table being provided with a plain or unriffled portion of suitable area located at the extremities of the riffles, means for feeding the material to the upper portion of the table's head, means for discharging water on the upper edge of the table, and suitable means for imparting to the table a longitudinally-reciprocating movement of a character adapted to move the material from the head toward the tail of the table."

It is to be borne in mind that a fundamental principle in the law of infringement is that unless all the elements of the claim are appropriated, there is no infringement.

3 Robinson on Patents, Sec. 922, page 96.
Tobey Furn. Co. v. Colby et al., 26 Fed., 100.
Newark Mach. Co. v. Hargett, 28 Fed., 567.
Byerly v. Cleveland L. O. Works, 31 Fed., 73.
Thoens v. Israel, 31 Fed., 556.
Prouty v. Ruggles, 16 Peters, 336.
Fuller v. Yentzer, 94 U. S., 288.
Water-Meter Co. v. Desper, 101 U. S., 332.
Rowell v. Lindsay, 113 U. S., 97.

The only qualification of the rule is where there

is substituted for an omitted element a known equivalent—an equivalent known to be such at the date of the patent.

Seymour v. Osborne, 11 Wallace, 516.
Rowell v. Lindsay, 113 U. S., 97.

The question to be decided therefore—the pivotal question in the case, is, *does the Deister table embody all the elements of these claims, or any of them?* If it embodies all the elements of any one or more of them, it infringes; if not, not. To that question we now invite the attention of the court.

The claims are so simple that we need not delay to make any formal analysis of them as is sometimes done. It will be most convenient to take the second claim first because it is the typical one of the three. It embodies two elements which we number (1) and (2) and put in italics so that they will appeal distinctly to the eye. It is in these words:

CLAIM 2.

> "A transversely-inclined concentrating-table having (1) *a number of longitudinal riffles extending a portion of the table's length from the head toward the foot, said riffles being of unequal length, the uppermost being the shortest while the other riffles increase in length from the upper edge to the lower edge of the table,* the table having (2) a *plain or unriffled portion lying at the extremities of the riffles and adapted to receive the material caught by the riffles.*"

It is scarcely necessary to say that a patent claim is to be read in connection with the things to which it

refers. If the language of the claim, taken in its plain, ordinary sense, fits the part or parts of the apparatus to which it relates, we know that that is the true sense of the words; if not, we must look into it further. Turning to Fig. 3, of the patent, which we insert again for ready reference, we find a construction corresponding exactly to the claim—the group of riffles of unequal length with the shortest at the top and increasing progressively to the lowest, and the plain, unriffled portion A lying at their extremities. The two elements of the claim correspond exactly to the two portions of the figure.

Does the Deister table contain these two elements? They comprise the whole Wilfley table. In some cases a claim will describe a device or part which may be transplanted from one environment to another so that the machine or apparatus into which it is transplanted can be said with truth to embody the elements of the claim. But here the elements of the claim constitute the whole table. To ask whether or no the Deister table contains the elements of Wilfley claim 2 is to ask whether the Deister table contains the Wilfley table, which is absurd. But counsel will say it may embody some principle or function which may be present in the operation of the Deister table. The Wilfley table, however, is a machine, and machine patents are granted for structures, not principles.

In Corning v. Burden, 15 Howard, 252, the court said, on page 268:

> "It is well settled that a man can not have a patent for the function or abstract effect of

(No Model.) 2 Sheets—Sheet 2

A. R. WILFLEY.

ORE CONCENTRATOR.

No. 590,675. Patented Sept. 28, 1897.

FIG. 3.

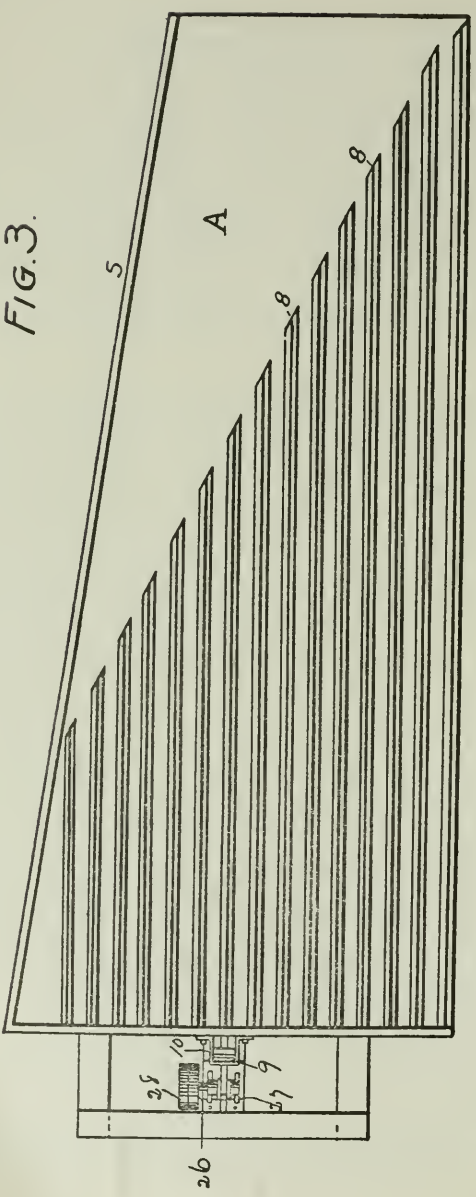
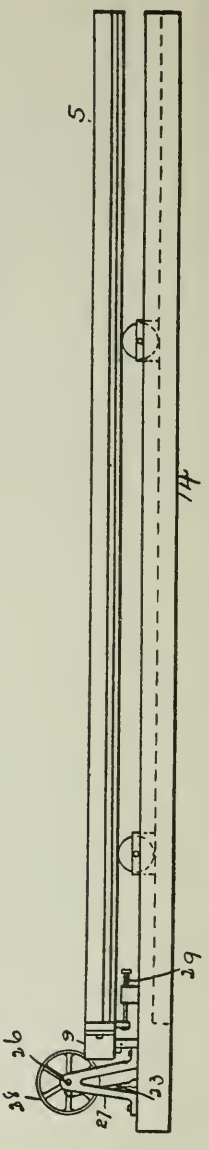


FIG. 4.



Witnesses
E. J. Delandis
Edith Hinsworth

Inventor
A. R. Wilfley
By his Attorney
A. J. O'Brien

a machine, but only for the machine which produces it."

In Burr v. Duryee, 1 Wall., 531, 570, the court said:

> "We find here no authority to grant a patent for a 'principle' or a 'mode of operation' or an idea, or any other abstraction. A machine is a concrete thing, consisting of parts, or of certain devices and combinations of devices."

In Fuller v. Yentzer, 94 U. S., 288, the court said, citing Burr, v. Duryee:

> "Patents for a machine will not be sustained if the claim is for a result, the established rule being that the invention, if any, within the meaning of the Patent Act, consists in the means or apparatus by which the result is obtained, and not merely in the mode of operation, independent of the mechanical devices employed; nor will a patent be held valid for a principle or for an idea, or any other mere abstraction."

Other cases could be cited by the dozen.

It follows that the Deister table does not infringe claim two.

CLAIM 1.

Claim 1 is in these words:

> "A transversely-inclined concentrating-table having a movement whose tendency is to carry the material longitudinally forward toward the tail or foot of the table, said table being provided with (1) *a number of riffles extending longitudinally a portion of the distance from its head toward its foot, said riffles varying in length for the purpose specified,* the table having (2) *a smooth, plain or unriffled portion extending from the ex-*

> *tremities of the riffles toward the tail of the table, whereby the* material as it leaves the riffles is subjected to the action of the water on the smooth portion of the table and the final separation of the mineral from the gangue effected."

It is not stated in this claim that the riffles increase in length progressively from the shortest to the longest, but that they "vary in length for the purpose specified." The purpose specified is the washing up action at the advancing terminals of all the riffles which we have described. No other purpose is specified in the patent. So that we have the same combination of a group of riffles of progressively increasing length in combination with a smooth portion at the extremities which is stated in claim 2, and which again corresponds exactly to the construction shown in Fig. 3. The Deister table does not infringe the first claim any more than the second.

CLAIM 7.

> Claim 7 is in these words:
> "The combination of a transversely-inclined concentrating-table having (1) *a series of riffles extending longitudinally from the head toward the tail of the table, said riffles being of unequal length, the upper-most being the shortest and the riffles increasing in length from the upper to the lower edge of the table,* the table being provided with (2) *a plain or unriffled portion of suitable area located at the extremities of the riffles,* means for feeding the material to the upper portion of the table's head, means for discharging water on the upper edge of the table, and suitable means for imparting to the table a longitudin-

> ally-reciprocating movement of a character adapted to move the material from the head toward the tail of the table."

Here we have a group of riffles of unequal length, the uppermost the shortest and increasing in length from the upper to the lower edge of the table, in combination with a smooth portion. Turning again to Fig. 3, we find the riffles and the smooth portion A exactly as called for in the claim. This claim also specifies "means for discharging water on the upper edge of the table." The first and seventh also specify a longitudinally recriprocating movement tending to move the material forward from the head toward the tail or foot of the table.

But inasmuch as the Deister table does not infringe if it omits any element of the combination we need not concern ourselves with the reciprocating movement, or the water supply, or the transverse inclination, or anything else except the two elements present in all three of the claims and conspicuously absent from the Deister—the group of riffles of progressively increasing length and the smooth space adjoining their terminals. The absence of these elements from the Deister table is so manifest to observation that a glance at the drawing is enough to show it.

It is a rule of construction applicable to every writing executed by men, from an international treaty to a lease of a potato patch, that words are to be taken in their natural and ordinary sense unless some reason appears for taking them in some other sense. No such reason appears here. The patent and its claims

are in the English language. The subject-matter—the deck of a concentrator, is simplicity itself. The court needs no help from experts to understand the meaning of the words or how to apply them.

If we have applied these claims to the subject matter correctly and according to law, we seem to be at the end of this case. And why have we not? There is no room for dispute about the structure of the two tables. There is no ambiguity in the words of the claims. An expert could mouth them over for a week without making them any plainer. So there we are.

We are aware, however, that counsel on the other side will try hard to maintain a different view of the claims, so we will try to forestall him, if we can, by reference to some cases on the subject. For this we will begin with those which we cited in the District Court, which are as pat as any we know of. But as we failed there we shall feel like adding a few more for good measure. It will be easy to skip the pages if they grow tiresome to the court.

McClain v. *Ortmayer,* 141 U. S., 419.

The suit was for infringement of two patents to McClain for improvements in horse collars. The decision of the case hinged upon the construction to be given to the claim of one of the patents. On this point the court said on pages 423-4 of the report:

> "While the patentee may have been unfortunate in the language he has chosen to express his actual invention, and may have been entitled to a broader claim, we are not at liberty, without running counter to the entire

> current of authority in this court, to construe such claims to include more than their language fairly imports. Nothing is better settled in the law of patents than that the patentee may claim the whole or only a part of his invention, and that if he only describe and claim a part, he is presumed to have abandoned the residue to the public. The object of the patent law in requiring the patentee to 'particularly point out and distinctly claim the part, improvement or combination which he claims as his invention or discovery,' is not only to secure to him all to which he is entitled but to apprise the public of what is still open to them. The claim is the measure of his right to relief, and while the specification may be referred to to limit the claim, it can never be made available to expand it."

In *Seabury* v. *Johnson,* 76 Fed., 456, the foregoing case was cited and applied. The suit was for infringement of a patent for a disinfectant in the form of a sulphur candle. The first claim, of which infringement was alleged, was in these words:

> "(1) A sulphur candle, provided with a surrounding band of metal, projecting slightly above the upper side or end of the main portion or body of said candle, substantially as described."

The defendant made a sulphur candle fixed in a paper box. It was held that it did not infringe. The following is from opinion on page 459:

> "But the inventor, for reasons doubtless satisfactory to himself, deliberately limited his claim to a 'metallic band,' although it is quite clear from the words of the specification that he was perfectly well aware that bands of

> other material might suffice. Believing that metal bands were 'preferable' he deliberately chose them for his monopoly, and chose them only. His act in so doing was nothing more nor less than a declaration that he abandoned to the public the right to use bands which were non-metallic. The law of patents requires that the patentee shall particularly specify and point out the part, the improvement, or combination which he claims as his invention or discovery. Courts are bound by the language chosen by the inventor; and they have neither the right nor the power to enlarge a patent beyond the scope of its claim, as allowed by the Commissioner of Patents."

Hubbell v. *United States,* 179 U. S., 77, 83-4.

Hubbell had a patent for improvement in metallic cartridges, which he claimed was being used by the government. He filed a petition in the Court of Claims for compensation, which was disallowed. From that disallowance he appealed to the Supreme Court, where it was affirmed. It was held that the cartridges used by the government were not within the terms of the claims of Hubbell's patent. In the proceedings in the Patent Office he had narrowed his claim to meet the objections of the Examiners. Upon the subject of the effect of such amendment and the construction of the claim the court said, on pages 83 and 84:

> "Whether the Examiners were right or wrong in so holding we are not to inquire, as the claimant did not appeal, but amended his claim and accepted a grant thereof; thereby putting himself within the range of the authorities which hold that if the claim to a combination be restricted to specified elements, all

must be regarded as material, and that limitations imposed by the inventor, especially such as were introduced into an application after it had been persistently rejected, must be strictly construed against the inventor and in favor of the public and looked upon as in the nature of disclaimers

" 'It may be observed that the courts of this country cannot always indulge in the same latitude which is exercised by English judges in determining what parts of a machine are or are not material. Our law requires the patentee to specify particularly what he claims to be new, and if he claims a combination of certain elements or parts, he cannot declare that any one of these elements is immaterial. The patentee makes them all material by the restricted form of his claim.' "

Stirrat v. *Excelsior Mfg. Co.,* 61 Fed., 980, C. C. A.

The patent in suit was for a water heating device for stoves and ranges. Without delaying to repeat the description of the device and discussion of the art found in the opinion, we quote from it the following statement, on page 984, of the rule applied to the construction of claims:

"The claim of a specific combination or device in a patent is a renunciation of every claim to any other combinations or devices for performing the same functions that are apparent from the face of the patent, and are not colorable evasions of the combination or device claimed. The statute requires the inventor to 'particularly point out and distinctly claim the part, improvement, or combination which he claims as his discovery.' Rev. St., Sec 4888. When, under this statute, the inventor has done this, he has thereby disclaimed and

> dedicated to the public all other improvements and combinations apparent from his specifications and claims that are not evasions of the device or combination he claims as his own. The claims of his patent limit his exclusive privileges, and his specifications may be referred to to explain and to restrict, but never to expand them."

Railroad Company v. *Mellon,* 104 U. S., 112.

The suit was on a patent for an improvement in the mode of attaching tires to the wheels of locomotives. The construction employed by the railroad company was not covered by the words of the claim; but it was argued on behalf of the patentee that it was adequately described in the specification, to which he sought to refer for explanation of the language of the claim. But this the court held to be inadmissible, and after quotation of the patent statute expressed its opinion as follows, on page 118 of the report:

> "As a rule, therefore, the specification filed with the application for letters patent contains a general description of the invention sought to be patented, which is followed by what is technically called the 'claim'. In reference to this latter part of the specification this court, speaking by Mr. Justice Bradley, has said: 'It is well known that the terms of the claim in letters patent are carefully scrutinized in the Patent Office. Over this part of the specification the chief contest generally arises. It defines what the office, after a full examination of previous inventions and the state of the art, determines the applicant is entitled to.' *Burns* v. *Meyer,* 100, U. S., 671. See also *Keystone Bridge Co.* v. *Phoenix Iron Co.,* 95 id., 274, 278.

> In view, therefore, of the statue, the practice of the Patent Office, and the decisions of this court, we think that the scope of letters patent should be limited to the invention covered by the claim, and that though the claim may be illustrated, it cannot be enlarged by the language used in other parts of the specification.
>
> We are, therefore, justified in looking at the 'claim' with which the specification of the appellee's invention concludes, to determine what is covered by his letters patent."

Burns v. *Meyer,* 100 U. S. 671.

The patent was for a side-saddle tree. The claim was for a "side-saddle tree having the side bars and seat made separate and then united."

The court said on page 672 of the report:

> "It is well known that the terms of the claim in letters patent are carefully scrutinized in the Patent Office. Over this part of the specification the chief contest generally arises. It defines what the office, after a full examination of previous inventions and the state of the art, determines the applicant is entitled to. The courts, therefore, should be careful not to enlarge, by construction, the claim which the Patent Office has admitted, and which the patentee has acquiesced in, beyond the fair interpretation of its terms."

Keystone Bridge Co. v. *Phoenix Iron Co.,* 95 U. S., 274.

The patent was for improvements in iron truss bridges, The improvement consisted in the use of wide, thin rolled iron bars with enlarged ends. The claim in controversy was in these words:

"3d, the use for the lower chords of truss frames of *wide* and *thin* rolled bars with enlarged ends, formed by upsetting the iron, when heated, by compression into moulds of the required shape, for the purpose of increasing the density, toughness and strength of the eye of the rod, and enlarging the eye, without diminishing its transverse section, substantially as hereinbefore described."

The defendant company used round or cylindrical bars. The following is from the opinion of the court by Justice Bradley on pages 278 and 279 of the report:

"When a claim is so explicit, the courts cannot alter or enlarge it. If the patentees have not claimed the whole of their invention, and the omission has been the result of inadvertence, they should have sought to correct the error by a surrender of their patent and an application for a reissue." * * * * As patents are procured *ex parte,* the public is not bound by them, but the patentees are. And the latter cannot show that their invention is broader than the terms of their claim; or, if broader, they must be held to have surrendered the surplus to the public."

Roemer v. *Peddie,* 132 U. S., 313.

Under this title there is a whole bunch of cases which were all heard and decided together—two from New York and two from New Jersey, and all in favor of William Roemer on a patent for a combined lock and handle for traveling bags. When the patentee was applying for his patent he tried to get a claim covering the combination of the lock-case with the handle-rings. He was rejected on a prior patent and amended his claim to confine it to a lock-case with notched sides near its ends to receive and hold the handle-rings. In

the suits on it before the court (four of them) he sought to give like effect to his amended claim to that which he could have given to the original. This the court held that he could not do. The following is from page 316 of the report:

> "The Patent Office would not grant a patent for it generally in combination with the handle-rings, but only specifically when used for the sides of the lock-case and for the handle-rings. The orator accepted the patent narrowed in that manner, and cannot now be heard to claim that it is any more broad than that in its scope. He invented this particular form of lock-case, and his patent is for that only, and it cannot be construed to cover anything else."

On the following page twelve Supreme Court decisions are cited in support of the proposition; to which may be added in the next volume *Phoenix Caster Co.* v. *Spiegel,,* 133 U. S., 360.

In *Brown* v. *Stilwell,* 57 Fed., 731 (C. C. A., 6th Cir.), in which the opinion was delivered by Judge Taft, this language was used on pages 739-40 of the report:

> "As the patentee has expressly limited himself to the connection with the boiler, he has given to the defendant below, and to the world, so far as he is concerned, the right to make the connection at any point outside the boiler and steam dome, without infringing his patent. This rule in the construction of patents is so well established as hardly to need authority."

In *Cincinnati Ry. Supply Co.* v. *American Hoist & Derrick Co.,* 143 Fed., 322 (C. C. A., 6th Cir.), the

opinion contains the following statement:

> "The law requires the patentee to define in his claim precisely what his invention is. This Crosby has done, and the court has no power to disregard the plain terms of the claim and either change or enlarge it by a reference to the specification."

In *Groth* v. *International Postal Supply Co.,* 61 Fed., 284 (C. C. A., 2nd Cir.), the patent in suit was recognized as embodying a primary invention, but the court said on page 287 in the opinion by Judge Shipman:

> "This just principle is one that is well recognized; but another principle is, at the present stage of the patent law, of equal force, which is that the construction of the patent must be in conformity with the self-imposed limitations which are contained in the claims, or, in the language adopted in *McClain* v. *Ortmayer,* 141 U. S., 419, 'if the language of the specification and claim shows clearly what he (the patentee) desired to secure as a monopoly, nothing can be held to be an infringement which does not fall within the terms the patentee has himself chosen to express his invention."

It is impossible to mistake the significance of these decisions. They mean that the claims of patents must be construed and applied according to the literal, plain meaning of their words. Nearly all patent controversies come at last to disputes about the meaning of words. It will help a little in that to consider what is the primary object of the claims in a patent. The statute grants to a patentee an exclusive right to make, use and sell something. What is that

something from which he is granted a right to exclude all the people of the United States except himself? He owes them the highest possible duty to let them know, so that they can respect his rights. The answer of the statute is that he must in his patent and as part of it "particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery." It follows that the words of a claim are to be taken and read in the sense in which they apply to and protect *the invention described in the specification.* When that appears clearly the meaning of the claim is clear.

That does appear in this case. The invention described in the specification is the concentrating table shown in Fig. 3 of the patent. It comprises two elements—a group of riffles of progressively increasing length, and an unriffled area adjoining their terminals—*one group and a single adjoining space.* The words of the claims describe the structure exactly; they protect the invention perfectly. The patentee is limited to the words which he has chosen taken in the sense in which they apply to his own invention. That is the meaning of the foregoing cases.

We can now take up the opinion of the District Court and see what reasons it gives for its judgment for the plaintiff, and whether they were good ones or not.

THE OPINION

In reading that document, which is found on pages 63 to 75 of the record, we cannot help feeling that the writer was a good deal at a loss to make up his mind

which way to decide the case. He was right in a large part of what he said, but finally rested his decision on a wholly immaterial and mistaken point. He recognized the true meaning of the claims in suit. He quoted them (Rec. p. 71-3) and said this about them:

> "While the language differs in each one of the specifications quoted, it is quite apparent from a reading of these claims that in the view of the inventor the smooth, plain, or unriffled area of the table constituted an important adjunct to the form and arrangement of riffles described, and discharged a function essential to the successful operation of his device. This is shown by the fact that in each and every instance in which he set forth and described his table, the form and arrangement of the riffles is described as being in association with a smooth or unriffled surface." (Rec. p. 73, lines 6 to 17).

But he thought Mr. Wilfley ought not to have limited himself so closely, and went on immediately to say:

> "But, assuming that the association of the riffled surface of the table with the smooth or unriffled surface was deemed important or even essential in the view of the inventor, yet if the essential feature of his device, which was new in principle and which in itself constituted a distinct improvement in the art of concentration, may be used in other combinations or with other devices but yet so as to discharge the same or an equivalent function, does the want of foresight in Wilfley in specifying its use in conjunction with such 'smooth' or unriffled surface' limit the protection afforded by his patent where his arrangement of riffles are similarly combined;

> that is, with a smooth or unriffled surface, or its mechanical equivalent? To answer this inquiry affirmatively would be to construe the patent as though it was 'for a narrow and specific improvement in an old art,' and nothing more than an improvement." (Rec. p. 73, line 17, to p. 74, line 3).

This was a mistake of law. We have cited cases *ad nauseam* to the proposition that the claims of a patent must stand as allowed by the Patent Office and accepted by the patentee. The court has no power to remedy his "want of foresight," as the District Court proposed.

He also fell into an error of fact in regard to the low, deflected riffles on the Deister. He thought that deflection was necessary to the operation of the table. He said on that subject:

> "I very much doubt if any table of the general type of the Deister and operated upon the same general principle could be successfully operated unless the riffles were arranged upon this plan.
>
> I am, therefore, persuaded that this diagonal arrangement of riffles is as essential a feature in the Deister table as in the Wilfley in the performance of its functions." (Rec. p. 71, line 7 to 15).

But in this he was mistaken. As we have pointed out on page 24 of this brief, the deflection downward of the shallow riffles on the Deister table is the final refinement of construction in it to secure the most perfect concentration. It was not necessary to the operation of the table. The riffles could have extended straight out to the concentrates discharge with sub-

stantially the same result. But Mr. Deister thought it would help a little to attract the last residue of sand over the riffles and hold the concentrates back to turn the riffles downward a little for the last few inches. The idea that the table would not work successfully without that deflection of the riffles was a total mistake. Not a witness testified to it. There was a great deal of controversy and a great deal of testimony about that zone on the Deister table—the space between the line B B and the concentrates discharge. Mr. Hodges testified that no work of concentration was performed in that zone; that concentration was complete when the material passed the line B B; that the 1–32nd inch high riffles were superfluous, and the space occupied by them was to be treated as though they were not there. It then became, as he thought, the equivalent of the smooth portion A of the Wilfley patent. But in all this he never made any point on the *deflected* position of the riffles, and manifestly could not. If that zone was to be treated as smooth space, it would not be because of the deflected position of the riffles, but because they performed no function of concentration. This is what Mr. Hodges said:

> "The space occupied by the 1–32nd inch thick riffles presents a relatively smooth, plain and unriffled surface which would be still smoother when in operation owing to the fact that the shallow terminals fill up to their full capacity with concentrates; no concentration takes place in the space occupied by those shallow riffles; the work of concentration is complete when the material reaches the line B B." (Rec. p. 185, last 2 lines, and p. 186, first 7 lines).

This quotation became one of prime importance to the defendant and we went to a world of trouble to refute Mr. Hodges. We hope the court will bear with us while we make this plain because this was the final ground of the decision against us in the District Court.

First, upon an inspection of a Deister table (any one) in operation there was plainly to be seen a constant flow of fine, white sand over the 1-32nd inch riffles across the riffles in the space between the line B B and the concentrates discharge. That meant that those parts of the riffles were doing concentration work just as the higher parts of the same riffles in the central portion of the table were, only the sand passing over them was extremely fine. All the coarser sands had been washed out before the material reached that part of the table. It was to remove that last remaining fine sand that the riffles were made so low. The court will find testimony on this point in the record from Gilbert H. Davidson, W. A. Moore, Rudolph Gahl, George Nord, Earle Schuyler and Gustave E. Hunt, all on pages 244 to 246 of the record. We content ourselves with these brief quotations:

Davidson, "Has seen sand with the naked eye passing over the low riffles on the Deister table."(Rec. p. 244).

Moore, "The process of concentration is not complete when the material crosses the line of the second stepdown in the riffles on the Deister table; you can see concentrates and sand passing over the riffles in

that part of the table; the sand is very fine and light colored." (Rec. p. 244).

Gahl, "The concentration of the material which passes the second stepdown is not complete at that point; some sand remains to be taken out; it can be seen passing over the low riffles." (Rec. p. 244-5).

Nord, "The concentration of material on the Deister table is not complete until it comes to the end where the concentrates go into the concentrates box; when the table is in operation sand can be seen passing over the thin riffles." (Rec. p. 245).

Schuyler, "Has noticed the part of the Deister table occupied by the very thin riffles; silica washes over those riffles; can see it when the table is in its regular and normal operation." (Rec. p. 245).

Hunt, "There is a continuous concentration taking place between the thin riffles all the time; the silica or sand can be seen with the naked eye passing over those low riffles." (Rec. p. 246).

Not that a clean cut and complete separation takes place between any two riffles at any time—all the sand in the space going over the riffle, and all the concentrates remaining behind in the riffle trough. The witnesses state that a trace of concentrates can be seen going over the riffles with the sand sometimes. But that is a characteristic of all concentration by flow over riffles. It is a separation of waste material from value time after time—that which goes over the riffles being mostly waste, but some value being kept back every time until finally it has all been extracted. The action here is such as to let nearly all the concentrates

between the low riffles keep moving on to the concentrates discharging apertures, and escape there. The quantity that reaches the lowermost riffle of the table is very minute. This evidence—the sight with the naked eye of the sand passing over the low riffles, testified to by the eight witnesses we have named, without contradiction in the record, is quite enough to refute expert Hodge's sapient opinion that no work of concentration is done by the low riffles on the Deister table. But we went further.

We made a set of observations of the most refined character upon the material passing between those low riffles. They are a trifle over a foot long. If a process of concentration is going on as the material passes between them two samples of the material taken from any one of the streams—one from the line B B and the other from near the concentrates discharge, ought to show a difference in richness. The sample taken from the end next the concentrates discharge ought to show more copper. And so it proved to be.

The facts are shown in the record on pages 242 last par., to 244, first paragraph and on page 256 there is noted the introduction of the exhibit drawing illustrating the method of taking the samples, which is here reproduced.

The manner of making the test and its result are shown in Mr. Kiddie's report, paragraph 3 on file in this case as an exhibit. We copy it as follows:

> "Paragraph 3.
>
> "In order to show that concentration was going on along the terminal riffles, the following method was employed. Two small scoops

of thin sheet copper were made, wide enough to fit between two of these riffles, with their edges filed sharp. These scoops were longer than they were wide and provided with a suitable handle. Two jets of water were arranged by means of a flexible rubber tubing provided with two pointed glass tips.

"Two men, each with a scoop and a water jet, took the samples. The two scoops were placed simultaneously between the same two riffles, one near either end with their sharp edges against the surface of the table and their long axes parallel to the riffles. With the water jets the concentrates lying between the two riffles from $\frac{1}{2}''$ to $\frac{3}{4}''$ in front of the scoop, were washed into the scoop and caught. This operation took the fraction of a minute, when the scoops were removed and the table again allowed to resume its normal work.

"Three sets of samples were taken in this way. In the first set, marked (1), 12 samples were taken on the 8th riffle, and 12 samples on the 12th riffle, numbered from the top of the table (nearest the feed box). These two riffles were selected because it could be seen that a moderate amount of sand was continually being washed over them.

"In the second set of samples marked (2) they were taken at every fourth riffle, beginning at the bottom of the table and working up to the top. This was repeated four times.

"(3) represents 20 samples taken more or less at random from riffles where an excessive amount of sand was being washed over.

"Samples taken between the terminal rifles on one Deister Table.

	Scoop A		Scoop B	
	% Cu.	% Ins.	% Cu.	% Ins.
(1)	12.44	59.26	20.60	32.68
(2)	18.42	37.26	24.76	16.16
(3)	22.42	21.70	28.22	7.00

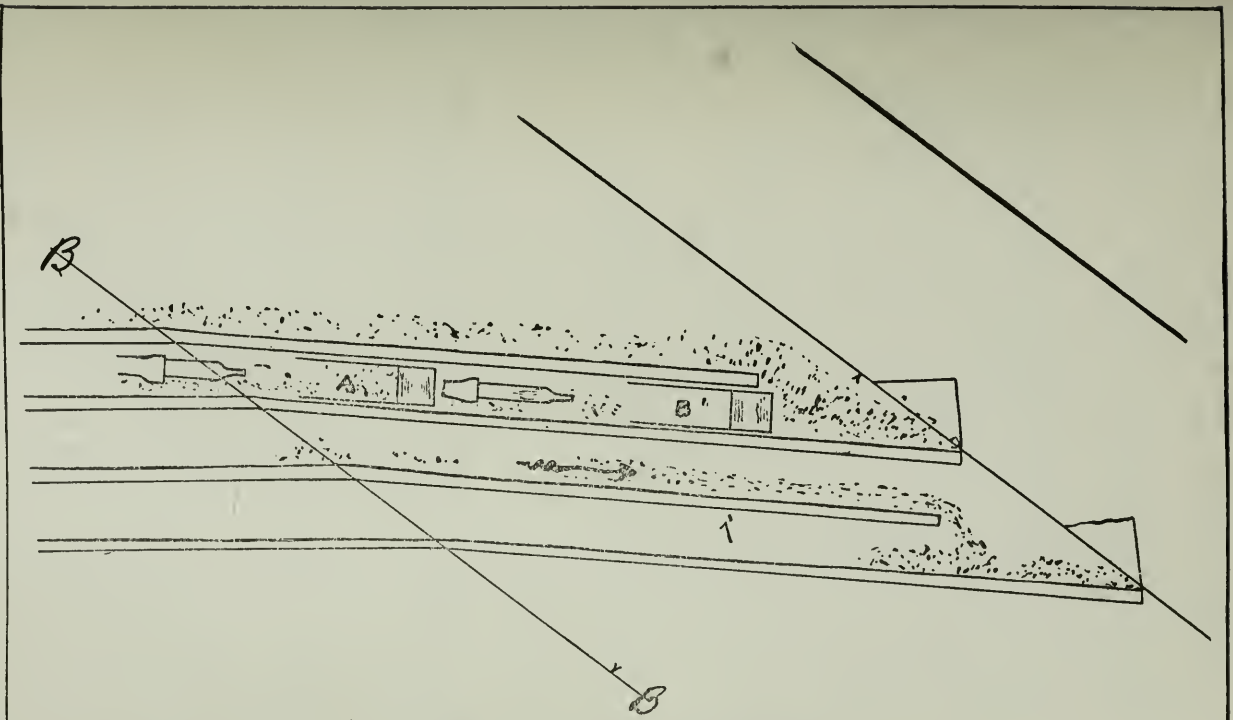


Diagram showing method of sampling Terminal Riffles on Deister Table

Scale 6'=1'

> "Before taking these samples, the table was set to throw the lines of concentrates approximately on the line following the end of the terminal riffles to the left of scoop A in the sketch.
>
> "The above results show a very material amount of cleaning taking place between the two points at which samples were taken off. This is shown by the decrease in the percentage of insolubles in the concentrates with a corresponding increase in the percentage of copper, as they traveled along the terminal riffles toward the discharge point."

The painstaking thoroughness of this report is remarkable. It embraced the following samples:

12 From the 8th riffle on the table.
12 From the 12th riffle on the table.
36 From every 4th riffle from the bottom.
20 at random.
80 in all.

Taking these as a whole, they speak absolute truth as certainly as that commodity is attainable by human effort.

But it is not quite enough to refute this blunder of expert Hodges. The court said, in the quotation above from page 71 of the record, that in its opinion it was doubtful whether the Deister table, or any table operated on the same general plan, could be successfully operated unless the terminal riffles were arranged in the diagonal position. We say that in that view the court was proceeding without evidence. Part of our proof of that assertion lies in the fact that while expert Hodges, to whom the court refers by name on page

69, devoted much space to the discussion of that part of the Deister table—the zone between the line B B and the concentrates discharge, he does not at any time refer to the *mere position* of the deflected riffles as a matter of any significance or importance.

Mr. Hodges' testimony, not including that in rebuttal, occupies 18 pages in the record (page 185 to 204), neglecting the two lines on page 204. For instance, on pages 193-4 he discourses thus:

> "There is not only this relatively plain, smooth and unriffled surface practically surrounding the outlets for the concentrates but also the slightly deflecting channels formed by the thirty-second of an inch thick terminals of the riffles extending a few inches back toward the mechanism end, which presents a relatively smooth, plain and unriffled surface and a surface which has the function of relative smoothness; or, in other words, a surface which is smooth enough to permit the unobstructed side wash of the water from the wash-water box, and at the same time which must be rough enough to facilitate and augment the clinging tendency of the heavier concentrates to the table surface at the concentrates discharge end. This portion of the table at the concentrates discharge end, where the terminals of the advancing riffles are located, would, in the operation of the table, be still smoother, and it would physically appear, owing to the fact that these shallow terminals fill up to their full capacity with concentrates as they pass over this portion of the table." (Rec. p. 193, last par., to 194, first par.)

If Mr. Hodges had considered that the slight inclination toward the foot of the table of the low

riffles on the Deister table was a feature, which, of itself, contributed to infringement, he would have said so here. But the whole point of his argument is that the riffles in that zone are so *shallow* that they are, in effect, no riffles at all, and may be neglected, and that space treated as smooth, like the space A on the Wilfley table. We shall comment on his testimony from another standpoint at a subsequent part of this brief. Our object in quoting his testimony now is to show that he made no point on the *deflected position* of the low riffles as constituting a feature of infringement.

Hence, the controlling emphasis placed on the deflected position of the low riffles of the Deister table in the opinion of the District Court was without warrant in the record.

We submit the foregoing as a complete justification of the second assignment of errors on pages 102-3 of the record, which is in these words:

> "The Court erred in holding that the low and diagonally deflected riffles on the said Deister Concentrator No. 2 were an essential feature of said Deister Concentrator."

In the last paragraph of its opinion, on page 75 of the record, the District Court gave the following final reason for its judgment:

> "In the particular that the arrangement of riffles used on the Deister table is the equivalent of the advancing terminals on the Wilfley, I hold, therefore, that the Deister table is an infringment upon the Wilfley patent."

What is an equivalent in the sense of the patent law? It is a device which accomplishes the same result as another device in substantially the same way. If it does not accomplish the same result, of course it is not an equivalent. If it accomplishes the same result in a different way, then, of course, again, it is not an equivalent. The Wilfley and Deister tables accomplish the same general result—the separation of the mineral from the sand. But the final step of the process—the elimination of the last residuum of fine sand, they accomplish in different ways. The Wilfley does it by repeated washings along the diagonal line of riffle tips adjoining the space A and a final washing up on that space. The Deister does it by bringing the riffles down to an extremely low elevation—1-32nd of an inch, giving them a slight inclination toward the foot of the table, and then passing the material over them, and so keeping up the process of concentration by riffles to the last step. It is the same process as that carried on in those parts of the table lying back of the line B B—between that line and the head motion, only adapted to the material to be treated. We have proved by the testimony of the six witnesses given on pages 244 to 246 of the record and the experimental demonstration by Mr. Kiddie, testified to by him on pages 242-4, all of which are discussed in this brief, that the work of concentration goes on over the low deflected riffles of the Deister table along their whole length, so that the fine sand that is taken out on the Wilfley by washing on a smooth surface is taken out on the Deister by flowing across riffles.

But, it may be said, after you have eliminated all the sand you can by flow across your shallow riffles you wash out a residue at the last instant by water from your washboard, so that washing up is the last step on the Deister as well as on the Wilfley. Yes, it is. But while again the same result is reached, it is not reached in the same way. On the Wilfley it is by wholesale—all the output of the machine at once on a single space; on the Deister it is in minute subdivisions, on sixteen little spaces at the terminals of the short riffles of each pair.

Upon these authorities and arguments we submit that the District Court erred in holding that the deflection of the riffle terminals on the Deister table made them the equivalent of the advancing terminals on the Wilfley. Which justifies the third assignment of errors, which is in these words:

> "The Court erred in holding that the diagonal deflection of the ends of the riffles on the Deister Concentrator was the mechanical equivalent of the advancing terminal arrangement of the riffles on the Wilfley table." (Rec. page 103.)

But the most serious error of the District Court was in its construction of the patent in suit. After a long general discussion of the subject the Court said this:

> "It is claimed by the defendants that, conceding that the use of the riffles with advancing terminals did constitute a distinct step in the art of concentration, yet the patentee, Wilfley, has limited his invention in this regard to its use in combination with a 'smooth or

> unriffled surface' by associating the two in each instance in which he described his invention and attempted to set forth its function or functions in his application for his patent." (Rec. page 71, third par.)

Following this the opinion, on pages 71-3, sets out in full the three claims in suit which are immediately followed by this comment: (Rec. page 73.)

> "While the language differs in each one of the specifications quoted, it is quite apparent from a reading of these claims that in the view of the inventor the smooth, plain, or unriffled area of the table constituted an important adjunct to the form and arrangement of riffles described, and discharged a function essential to the successful operation of his device. This is shown by the fact that in in each and every instance in which he set forth and described his table, the form and arrangement of riffles is described as being in association with a smooth or unriffled surface." (Rec. p. 73, lines 6 to 17.)

Which is quite true. But this true statement is immediately followed by the following erroneous one —the fundamental error of the opinion, in these words: (Rec. pages 73-4.")

> "But, assuming that the association of the riffled surface of the table with the smooth or unriffled surface was deemed important or even essential in the view of the inventor, yet if the essential feature of his device, which was new in principle and which in itself constituted a distinct improvement in the art of concentration, may be used in other combinations or with other devices but yet so as to discharge the same or an equivalent function,

> does the want of foresight in Wilfley in specifying its use in conjunction with such 'smooth or unriffled surface' limit the protection afforded by his patent to cases where his arrangement of riffles are similarly combined; that is, with a smooth or unriffled surface, or its mechanical equivalent? To answer this inquiry affirmatively would be to construe the patent as though it was 'for a narrow and specific improvement in an old art,' and nothing more than an improvement." (Rec. p. 73, line 17, to p. 74, line 3).

This attempt of the court to amend the claims on the ground that it was a "want of foresight" in Wilfley to make them as narrow as they are is without the least warrant of law. The whole tenor of the array of cases with which we have taxed the forbearance of the court is to the point that a patentee is bound by his claims as he accepted them from the Office. One sentence from McClain vs. Ortmayer, 141 U. S., 419, in which Justice Brown said this, on pages 423-4 of the report is pat to the point here.

> "While the patentee may have been unfortunate in the language he has chosen to express his actual invention, and may have been entitled to a broader claim, we are not at liberty, without running counter to the entire current of authority in this court, to construe such claims to include more than their language fairly imports."

The claims in suit are all based on Fig. 3 of the patent. We do not think it would have been possible for Mr. Wilfley to make any broader claims upon it than those allowed him. But however that is, he is bound by those he accepted beyond the

power of the District Court to help him out on the ground of "want of foresight."

And this is our justification for assignments of error Nos. 4 and 5 on page 103 of the record; and enough in our humble judgment to require a reversal of the judgment below.

It should be noted here (by way of parenthesis) that the court has before it two appeals submitted as a single case: one by the "Detroit Copper Mining Company of Arizona" and the other by the "Arizona Copper Company." The two companies were sued separately and appealed separately. The evidence was taken in the case against the Arizona Company, but by stipulation was to apply to both cases. Hence, the court will find in the record *two* assignments of error identically alike, one by each appellant—one on pages 102-3 and the other on pages 104-5.

It would not be relevant to the question of infringement to show that the Deister table is a better concentrator than the Wilfley. It might be that and still be an infringement of the patent. But when the District Court endorses the plaintiff's contention that the claims in suit are entitled to a favorable construction on the ground of the superior excellence of the table, that question becomes a material one. In laying out the case for decision the District Court on the first page of its opinion as printed in the record stated the respective contentions of the parties as follows: (Rec. p. 64; lines 15 to 26.)

> "It is contended on behalf of the plaintiff that the Wilfley patent embodied a new

> principle in the art of wet concentration of ore and the machine patented was the first to perform a new and definite function in the practice of ore dressing, so as to produce both increased efficiency and capacity. On the other hand, it is contended on behalf of the defendants that the Wilfley patent was for a narrow and specific improvement in an old art, and therefore to be construed and limited accordingly, and as so construed does not cover any essential feature embodied in the Deister machine."

Later on, near the close of the opinion, the court said this: (Rec. p. 74; lines 4 to 17.)

> "Whether we regard the Wilfley device as a distinct step in the art of wet concentration of ores, it certainly introduced a new principle which was more than a mere improvement on something therefore known into the art. If an improvement, it was therefore of the kind which, under well-settled rules of construction, is not to be limited strictly to the precise device or arrangement described in his application, but is to be given such a construction as will at least protect the inventor in the use of that feature of his device which is new in principle and which is the essence of his invention, as against others who may use it, or its mechanical equivalent, to produce the same result."

Is it true, as the court found, that the Wilfley patent embodied a new principle in the art of wet concentration of ores and that the machine patented was "the first to perform a new and definite function in the practice of ore dressing so as to produce both increased efficiency and capacity"? It is not.

As often happens when men talk loosely, on the bench or off it, truth and error are mixed up in this statement. In a sense the Wilfley table does embody a new principle. If it did not, it would not be patentable. We shall discuss that subject in a later part of this brief.

The error is in the statement that some principle or function produced "both increased efficiency and capacity" in the Wilfley concentrator. That is a claim to be proved by evidence. Who testified to it? Not any one. There is not a particle of evidence in the record that the Wilfley concentrator is superior in efficiency or capacity to any other. On the contrary, there is express evidence that it is inferior to the Deister. In January, 1909, John Kiddie, expert assayer of the Arizona Copper Company, made a comparative test of a Wilfley and a Deister machine under the direction of the general manager of the company. The test extended over a period of twelve days. All the facts of the test were tabulated and the record put in evidence. (Rec. page 246-7.)

This record is on file as an exhibit, and we reproduce it here.

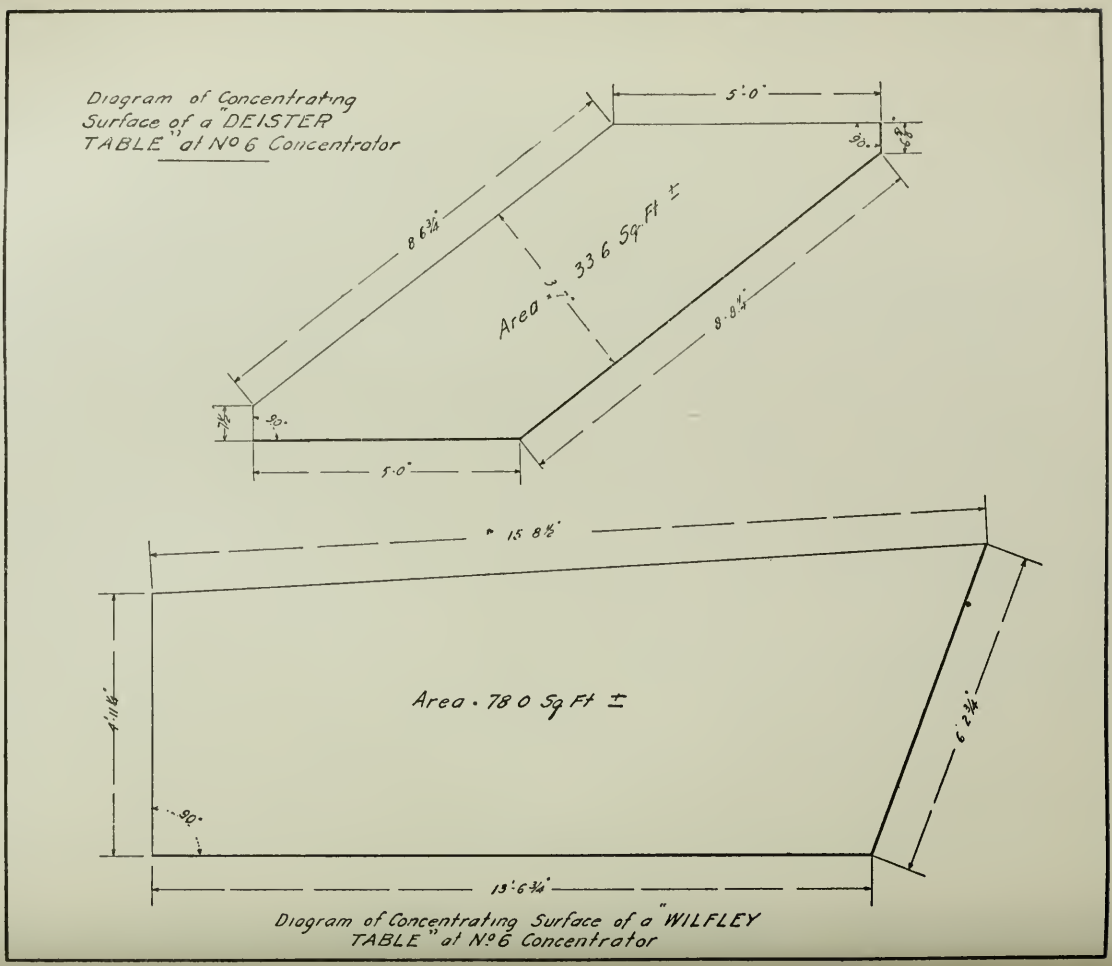
It will be found in the testimony of John Kiddie, page 246 to 247 of the printed record. He embodied the results of the test in a table which was put in evidence, and is on file amoung the defendant's exhibits sent up by the clerk of the District Court. This test was made in January, 1909, as a matter of business, and not for the purpose of evidence in this case or any other. It was made by direction of the general

Date	Machine	Hrs Run	Tons Feed per 24 hours	Pounds Dry Concentrates	Assay of Concentrates	Pounds Copper in Concentrates	% Relative Saving in Terms of Wilfley	Approx Extract	Assay of Heads	Assay of Tails	% Solids in Feed	Stroke in Ins.	RPM	Table
1/16/09	Deister	2½	12.24	297 3/4	17.28	51.45	115.1	67.6	2.86	1.03		3/4	280	3½"
"	Wilfley	"		249½	17.89	44.63	100.0	60.0	2.86	1.24		1	262	
1/17/09	Deister	2	12.52	211	17.93	37.83	108.3	61.4	2.89	1.24	3.18	1 3/16	283	3/4"
"	Wilfley	"		210	16.63	34.92	100.0	57.0		1.38		1		
1/18/09	Deister	2	9.94	255	13.03	33.23	119.2	72.0	2.62	0.83	2.49	1 3/16	280	1"
"	Wilfley	"		208 3/4	13.35	27.87	100.0	68.0		0.97		1		Forward end of high Riffles removed.
1/19/09	Deister	2	12.69	302 3/4	16.25	49.20	118.5	70.0	3.22	1.12	2.84	1 3/16	288	1¼"
"	Wilfley	"		262 1/4	15.82	41.49	100.0	63.0		1.37		1		6.1 4.15 13.7 6.5 4.5 6.8 20.9 - % Wt.
1/20/09	Deister	2	13.17	354	16.00	56.64	121.5	70.5	3.51	1.23	2.74	1 3/16	281	3/4" 20 - 40 - 60 - 80 - 100 - 200
"	Wilfley	"		310	15.03	46.59	100.0	63.3		1.51		1		0.43 1.23 2.64 4.39 6.25 8.06 3.52 - % Cu
1/21/09	Deister	2	8.52	260 1/4	12.70	33.02	120.8	74.2	2.90	0.83	2.90	1 3/16	281	3/4"
"	Wilfley	"		212 1/4	12.87	27.35	100.0	67.6		1.11		1		
4/22/09	Deister	2	16.37	298	11.62	34.63	117.6	59.0	2.13	0.98	2.75	1 3/16		3/4"
"	Wilfley	"		231	12.74	29.43	100.0	51.5		1.13		1		
1/23/09	Deister	2	13.20	288	15.80	45.50	106.0	69.3	2.97	1.05	2.54	3/4	283	1"
"	Wilfley	"	13.46	248	17.30	42.90	100.0	64.5		1.19		1		
1/24/09	Deister	1½	38.65	3.57	13.10	46.70	117.9	44.7	2.12	1.26	3.24	1 3/16	281	1¼"
"	Wilfley	"		2.60	14.20	39.60	100.0	36.5		1.42		1		7.0 30.6 10.4 9.5 7.4 35.1 % Wt. 20 - 40 - 60 - 100 - 200
														1.54 1.45 2.04 2.90 4.25 2.08 - % Cu
2/1/09	Deister	2	19.84	343	12.60	43.22	111.0	61.1	2.10	0.91	1.62	1 3/4	281	1⅛"
"	Wilfley	2		315½	12.30	38.81	100.0	57.1		1.00		1¼		Feed: Spigot of Cone hydr. Class
2/2/09	Deister	2	17.65	299½	15.57	46.63	110.0	61.8	2.56	1.09	1.66	1 3/16	280	1⅛"
"	Wilfley	"		288½	14.66	42.29	100.0	56.3		1.24		1¼		15.0 4.19 8.9 3.6 3.9 4.8 21.9 - % Wt. 20 - 40 - 60 - 80 - 100 - 200
														1.14 1.35 2.99 3.12 3.90 5.00 3.00 - % Cu.
2/3/09	Deister	1½	25.50	268	12.74	34.14	136.6	52.1	1.99	1.04	2.35	1 3/16		1⅛"
"	Wilfley	"		195½	11.12	21.74	100.0	35.5		1.37		7/8		
1/26/09	Deister	2	9.37	244	11.50	28.06	100.7	68.5	2.56	0.95	2.19	3/4	287	2"
"	Vanner	"		169	16.50	27.88	100.0	67.5		0.93		1	210	5.6 28.5 10.5 10.9 10.5 34.0 - % Wt. 20 - 40 - 60 - 100 - 200
														1.10 1.01 1.79 3.92 5.32 2.78 - % Cu

Run of 1/24/09 - Measuring on Linolium, discharge end of Deister Table was ½" Lower than Feed and
" " 1/26/09 - " " " " " " " " " ⅛" Higher "

Direct Average of Tailings - Deister Table 1.05 % 14.55 %
" " Concentrates - Wilfley Table 1.24 % 14.49 %

manager of The Arizona Copper Company, one of the appellants in this case, before any Deister tables had been put into use in the mill, in order, manifestly, to ascertain the value of this new type of machine. Every precaution was taken to insure accuracy in every particular. By means of an automatic device the feed was divided equally between the two machines. The test extended over twelve days, with an average run of about two hours per day. That is, the machines were started and run two hours. Then the whole product of concentrates was taken off from each table, dried and assayed. Next day the same process was repeated. Mr. Kiddie states the facts fully in his deposition and explains the various columns of the table in which the test is summarized and which we here reproduce. Without going into details at length, it will be sufficient to call attention to the columns headed "Dry Concentrates," and "pounds of copper in concentrates," to see how far Deister was ahead in the race. All other points of comparison, however, are merged in column headed "Savings in terms of Wilfley." In that column the total saving of copper from the pulp fed to the Wilfley machine is represented arbitrarily by 100, and the total saving by the Deister machine stated in the form of a per cent. upon 100. This furnishes a perfect basis of comparison. If in any run the saving made by the Deister table were exactly equal to that made by the Wilfley it would be denoted by 100. If less, by a minus figure, as -10; if more, by a figure above 100. The Deister figures in the columns are all more than 100. And they show


Diagram of Concentrating
Surface of a "DEISTER
TABLE" at No 6 Concentrator
5:0"
8 6 3/4"
Area = 336 Sq Ft ±
8:8 1/4"
7 1/2"
90°
5:0"
15 8 1/2"
4:11 1/2"
Area = 780 Sq Ft ±
6:2 3/4"
90°
13:6 3/4"
Diagram of Concentrating Surface of a "WILFLEY
TABLE" at No 6 Concentrator

an average of approximately 116. That is, the Deister machine extracted nearly one-sixth more copper from the same pulp.

But the Deister table beat the Wilfley in other respects, also. Gustavus E. Hunt, superintendent of the mill of the Detroit Copper Mining Co.—one of the appellants here, testified that he was familiar with Deister Concentrator No. 2; that 38 Wilfley tables were used in that mill; that he had opportunity to compare the Wilfley and Deister concentrators at work; that he made no distinction between them as to amount of work, but gave them the same load each. (Rec. page 246.)

He produced drawings showing the dimensions of both tables, which we reproduce here.

The significance of these comparisons of size, weight and working capacity lies in the fact that these machines are all used under cover—hundreds of them, in one great concentrating mill, where space and power are valuable. The ore concentrator that will do the most work in the least space and with the least outlay of power is the best.

In the next to the last paragraph of the opinion on page 74, last four lines, and page 75, first three lines, of the record, the court said this:

> "It seems to me that the Wilfley patent, in view of its history and its importance, should be construed, notwithstanding the language used by the inventor in his application as covering the appropriation by the Deister table of this essential feature of the Wilfley table, and that, therefore, the former

is an infringement pro tanto of the Wilfley patent."

This is an error, both in fact and law. The Wilfley table was not in fact superior to any other, as we have shown. And if it had been, it was the duty of the court to construe and enforce the claims of the patent according to the rules of the law. Those words "notwithstanding the language used by the inventor in his application" express a license which the court had no right to take. If we are right in this, it is our justification of the sixth assignment of error, which is in these words:

> "6. The Court erred in holding that in view of the history and importance of the Wilfley patent in suit it should be construed notwithstanding the language used by the inventor as covering the appropriation of this essential feature of the Wilfley table."

This disposes of all the errors assigned except Nos. 1, 7 and 8, which are in these words:

> "1. The Court erred in holding that the Deister Concentrating Table No. 2, the machine which was the subject of the litigation, was an infringement of the patent in suit."
>
> "7. The Court erred in denying the defendants' petition for rehearing."
>
> "8. The Court erred in rendering judgment for the plaintiff."

As to these, the first and eighth are in general terms, and we offer this whole brief in support of them. The petition for rehearing referred to in the seventh is in the record at pages 76 and 77, and was overruled by

the court, erroneously, as we think. But the first, second, third and sixth reasons assigned for a rehearing are identical in effect with errors assigned here which we have discussed; and we can discuss more conveniently the matters of the fourth and fifth in another connection a little later.

This concludes our discussion of the opinion of the District Court.

As we remarked at the outset, this comparison of the merits of the two tables would not be material upon the issue of infringement if it were not for the fact that the District Court accepted as true the claim of counsel for the plaintiff that the Wilfley table possessed "both increased efficiency and capacity" and gave weight to that supposed fact in its findings and judgment for the plaintiff. That action by the court makes it material to know whether there was any foundation in the testimony for the assumption on which it proceeded. We have now shown that there was not; that the contrary was the fact.

This brings us to a sort of stopping place at which we may pause a moment and see where we are. We have done this.

1. We have laid before the court full and accurate descriptions of the Wilfley and Deister tables for comparison.

2. We have shown by careful analysis of the language of the Wilfley patent, taken in connection with Fig. 3, that it describes a simple, clean cut, unmistakable two-part combination of a group of riffles with a

relatively short one at the top and the others increasing progressively in length to the last one at the bottom, and a single unriffled space adjoining the terminals of all the riffles.

3. We have studied and analyzed the claims in suit.

4. We have compared the claims with the Deister table with the result that it appears that it does not infringe.

5. We have discussed the opinion of the District Court at length with the result that it appears clearly to be erroneous both in fact and law.

Is that not enough to reverse the decision?

THE EXPERTS

This all seems to be so plain that one can not help wondering how it happened that the District Court found for the plaintiff. Experts. That's the explanation. The defendant's case was smothered under depositions of experts. Hundreds of pages of the big record were filled with them. The record in this court, condensed as it is, and had to be under the new equity rules, contains depositions of five experts, aggregating sixty-four pages.

We are not intending by these remarks any wholesale condemnation of the testimony of experts in patent cases. There are cases in which it is highly important. Sometimes a machine or process is so intricate that the court cannot understand it without the help of one skilled in the business. Such a question might arise in a suit on a patent for an improvement in locomotive engines. Or questions may arise requiring expert

knowledge of chemistry or electricity, or the like, for their solution. But experts who are mere jugglers with words, who have no rare or useful knowledge about anything, and whose sole business it is to make words mean anything you want them to were the bane of the old patent practice. If the new equity rules never bear any other fruit of good results, the reform which they have brought in the introduction of expert testimony in patent cases will be enough for their justification. The testimony of the experts was a fruitful source of error in this case. Nearly all the plaintiff's witnesses undertook the role of experts, but there were two to whom alone we shall refer. They are Robert H. Richards and Vernon E. Hodges. Richards led the way. He set the pace, and the others followed. This was his first speech:

> "The Wilfley table was a great advanced stride and initiated a new era in concentrators: Wilfley put his riffles on with the diagonal ending—the advancing terminals, as they are called, and from a structural point of view also tapered his riffles and so added to the strength of the machine in getting an automatic control of the line of change of detention by such means." (Record, 143, last 4 lines to page 144, first 4 lines).

A little later, on cross examination, he introduced some new words into the vocabulary of the case:

> "The result of Wilfley's discovery divides the table into three parts—roughing plane, cleaning plane and diagonal of mechanical control of change of detention; this is the great advance that Wilfley has made, the

> advance that has made his table the forerunner of a new type of table." (Record, 158, last two lines, page 159, first 5 lines.

Why does he go round the bush to invent these expressions? If a man wanted to talk candidly about the Wilfley table, he would use the words that belong to it—riffles, riffled and unriffled, smooth, or plain space. It is easier to say "riffle" than "roughing plane." There's a cat in the meal tub somewhere. This word juggler is coining these innocent phrases to use later on. We shall see.

The words "smooth, plain and unriffled" are used many times in the specification and claims of the Wilfley patent. They were embarrassing words for counsel and experts to deal with in trying to make out infringement against the Deister table. But expert Richards was equal to it. On page 162 he says:

> "When the word 'smooth' or 'unriffled' is used in this art it would have the meaning 'smooth enough' or unriffled enough' for the performance of the function which it is calculated to perform, in speaking of the roughing surface as compared with the cleaning surface of the table; it is not necessary on either the Wilfley or the Deister table, in practical operation, to perform the functions of advancing terminals of riffles terminating on a smooth surface that the smooth surface should have any definite dimension or form, only sufficiently smooth and large to accomplish the function described; (here the cat emerges from the tub) the Deister table is a structure provided with a plain or unriffled portion of the suitable area located at the extremities of the riffles for the purpose specified in the Wilfley patent." (Record, 162, first 16 lines).

Mr. Wilfley follows the lead of his expert, and says on pages 175-6 of his own table:

> "The Wilfley table is provided with a roughing surface sufficient to catch, stratify and direct all the concentrates and enough of the tailings to secure protection to the concentrates up to the line of final separation." (Record, 175, last line and 176 first 4 lines).

And then of the Deister:

> "The Deister table is provided with a roughing surface, with riffle cleats and channels sufficient to catch, hold, stratify and direct all the mineral and enough of the gangue to protect the mineral up to the line of final separation." (Record, 176, lines 9 to 13).

It would be a safe bet that Mr. Wilfley never called the riffled portion of his table a "roughing surface" until he learned it from Richards.

VERNON E. HODGES

Now comes the professional expert. Richards was not that. He was a college professor, doing a little experting on the side. His associates called him "Doctor," and when it comes to prescribing words for a sick infringement case he certainly deserves the name. But Hodges makes no such pretentions. His business is to swear to opinions on any side of any case about the meaning of words or anything else. He justified his devotion to business in this case. He started out with this pronouncement on pages 188-9.

> "In the Wilfley table the esential characteristics are that of a relatively rough area, which

> area is the riffled portion where the initial work of concentration is performed and the relatively smooth portion where the final separation takes place, a portion which must be smooth enough to permit the side-flow of wash water to wash away the lighter silica which arises to the top and at the same time sufficiently rough to cause the heavier concentrates to cling to this surface and permit the wash-water to flow over it, so that the concentrates retain their position on the surface by reason of a sufficient roughness in it, while the lighter weight is carried over the tailings discharge side of the table." (Record, 188, last 9 lines, to page 189, first 6 lines).

With these manufactured words of description in hand it was an easy thing for him to find infringement in the Deister table. Thus on page 192:

> "I find the same main characteristics of relatively rough and smooth areas or riffled and relatively unriffled areas in this Deister table." (Record, 192, lines 17 to 21).

And on page 193, this:

> "The inclined surface of the wash board of the Deister table as represented by Complainant's Exhibits Nos. 5 and 6, is simply a portion of the so-called smooth, plain and unriffled surface of the Wilfley table reduced to a minimum." (Record, 193, lines 6 to 10).

That is, the unriffled space on the Wilfley table is not really a smooth, plain and unriffled surface at all, as the specification and claims call it, but only a "so-called."

Then follows, on pages 193-4, Mr. Hodges main speech—his *chef d'oeuvre,* in these words:

> "There is not only this relatively plain, smooth and unriffled surface practically surrounding the outlets for the concentrates but also the slightly deflecting channels formed by the thirty-second of an inch thick terminals of the riffles extending a few inches back toward the mechanism end, which presents a relatively smooth, plain and unriffled surface and a surface which has the function of relative smoothness; or in other words, a surface which is smooth enough to permit the unobstructed side wash of the water from the wash water box, and at the same time which must be rough enough to faciliate and augment the clinging tendency of the heavier concentrates to the table surface at the concentrates discharge end. (Record, 193, last par. to 194, first 11 lines).

From there to the end of his testimony on page 204 he occupies himself with an elaborate attempt to explain away the claims of the Wilfley patent through which we will not follow him except to note that his last word (on page 204) is to repeat his insult to the"Wilfley's 'so-called' 'smooth, plain and unriffled' surface."

We all know that it was the habit of patent experts under the old practice to stretch and strain the words of claims to make them fit their theories of cases. But who ever heard before of such distortion of language as this? To discard the plain words of the patent—"riffled" and "unriffled," which describe perfectly the configuration of the Wilfley table deck, and substitute for them the vague phases "relatively rough" and

"relatively smooth", and then say that because the riffles on the Deister table are higher at the head motion end than at the concentrates discharge end those parts are therefore relatively rough and relatively smooth, and hence the Deister table infringes the Wilfley claims. No witnesses testified in the District Court that the Deister table infringed except the experts; and this is the way they did it. And this stuff is sworn to and offered as evidence in a court of justice, and accepted and acted on and a decree of infringement rendered. Will not this court be eager to reverse such proceedings as these?

It is refreshing to turn from this wicked travesty of the law to the dignified and clear utterance of the Supreme Court in these two old patent cases.

Corning v. *Burden,* 15 Howard, 522, was a suit on a patent for a machine for rolling puddle balls in the manufacture of iron. On page 270 of the opinion the court said this on the subject of the functions of experts in patent cases:

> "The refusal of the court to hear the opinion of experts, as to the construction of the patent, was proper. Experts may be examined as to the meaning of terms of art on the principle of, *'cuique in sua arte credendum,'* but not as to the construction of written instruments."

To the same purport is *Winans* v. *N. Y. & Erie R. R. Co.,* 21 How., 88, which was a suit on a patent for improvement in railroad passenger cars. On pp. 100-1 the court said this on the subject of experts:

> "Experts may be examined to explain terms of art, and the state of the art, at any given time. They may explain to the court and jury the machines, models, or drawings exhibited. They may point out the difference or identity of the mechanical devices involved in their construction. The maxim of *'cuique in sua arte credendum'* permits them to be examined to questions of art or science peculiar to their trade or profession; but professors or mechanics cannot be received to prove to the court or jury what is the proper or legal construction of any instrument of writing. A judge may obtain information from them, if he desire it, on matters which he does not clearly comprehend, but cannot be compelled to receive their opinions as matters of evidence. Experience has shown that opposite opinions of persons professing to be experts may be obtained to any amount; and it often occurs that not only many days, but even weeks, are consumed in cross-examinations, to test the skill or knowledge of such witnesses and the correctness of their opinions, wasting the time and wearying the patience of both court and jury, and perplexing, instead of elucidating, the questions involved in the issue."

This closes what may be called the first division of this brief. We have reached twice already what seemed to be a logical end of the argument. First, when on page 34 ante, we had shown as we thought by analysis of the Wilfley patent and its claims that the Deister table did not infringe it. Then again, when we had demonstrated, as we believed, the errors of the opinion of the District Court on page 67. Surely a judgment based on an opinion which was so far

erroneous both in fact and law must be wrong. And now, most of all, that we have shown that there was no evidence of infringement except the testimony of experts resting on a distortion of words scarcely less than criminal in its wickedness.

But there is another view of the subject without which the argument which we wish to make will be incomplete. It rests on a line of cases to which we have not yet referred, and to which we now ask the attention of the court. The most important one of these is *Railway* v. *Sayles,* 97 U. S. 554, decided in 1878. It is the most important patent decision made in recent years. The suit there decided was for infringement of a patent to one Tanner as assignee of Thompson and Bachelder for improvement in railroad car brakes. The gist of the opinion is in the following extracts; first from pages 556-7, as follows:

> "Like almost all other inventions, that of double brakes came when, in the progress of mechanical improvement, it was needed; and being sought by many minds, it is not wonderful that it was developed in different and independent forms, all original, and yet all bearing a somewhat general resemblance to each other. In such cases, if one inventor precedes all the rest, and strikes out something which includes and underlies all that they produce, he acquires a monopoly, and subjects them to tribute. But if the advance towards the thing desired is gradual, and proceeds step by step, so that no one can claim the complete whole, then each is entitled only to the specific form of device which he produces, and every other inventor is entitled to his own specific form, so long as it differs

from those of his competitors, and does not include theirs.

The opinion then goes on to mention several railroad car brakes prior to the invention of Thompson and Bachelder, specifying in particular, on page 559, two, in these words:

> "Without noticing those inventions, the dates of which are disputed, it is sufficient to refer to two instances in point, the existence of which before 1846 cannot be seriously controverted. We refer to those known as the Springfield brake and the Millholland brake. These brakes may not have been, and were not, so perfect as that of Thompson and Bachelder, and others constructed at a later period; but they were used, and used successfully; sufficiently so, at least, to have sustained patents for inventions, had patents been applied for."

And finally, on page 561, the place of Thompson and Bachelder in the art is summed up as follows:

> "But their construction and use, though with limited success, are sufficient to show that Thompson and Bachelder were not the pioneers in this field of improvement, and that they were not the originators of the double brake, nor of the use of rods, chains, and similar appliances for connecting the brake systems of two trucks under a car. They invented a particular apparatus for doing the desired work; and they can only claim their particular apparatus, or that which is substantially the same."

One passage in the first quotation above compresses so much in so little space, and states in so

few words a principle of such wide application that it has become famous. It is this:

> *"In such cases, if one inventor precedes all the rest, and strikes out something which includes and underlies all that they produce, he acquires a monopoly, and subjects them to tribute. But if the advance towards the thing desired is gradual, and proceeds step by step, so that no one can claim the complete whole, then each is entitled to his own specific form, so long as it differs from those of his competitors, and does not include theirs."*

This legal proposition has had a unique history. Since its promulgation in 97 U. S. (1878) it has been cited with approval in *fifty-five decisions of federal courts.* We are not asking the court to take our word for that. To dig up that number of cases is beyond our industry. We have it from Rose's Notes, Vol. IX., page 580. That indefatigable author has there, within the limits of two pages, given specific reference to every one of those fifty-five cases.

A statement of a rule of law so concise and yet so comprehensive as that which we have quoted from *Railway* v. *Sayles,* may well be called a theorem—Bradley's theorem.

It would be unreasonable to follow Mr. Rose at length through the cases cited by him approving Bradley's theorem. But the case of *Railway* v. *Sayles* and the place which it holds in the law have a highly important—we might say controlling bearing on the questions to be discussed here, and we beg the court's forbearance while we refer specifically to a few of them.

In *Duff* v. *Sterling Pump Co.*, 107 U. S. 636, the patent was for an improvement in washboards. The improvement consisted in substituting for the continuous transverse ribs, or raised projections of the old washboard a surface both longitudinally and transversely ribbed or corrugated; the effect being to produce a surface studded with small *pyramidal* projections. The defendant's washboard was provided with *diamond-shaped* projections each bounded by diagonal grooves or depressions.

The court did not question the validity of the patent sued on, but after referring to prior patents to Galusha and Safford, and Crihfield, said:

> "The case is one where, in view of the state of the art, the invention must be restricted to the form shown and described by the patentee. In the field of washboards made of sheet metal, with the surface broken into protuberances formed of the body of the metal, so as to make a rasping surface, and to strengthen the metal by its form, and to provide channels for the water to run off, Todd was not a pioneer. He merely devised a new form to accomplish these results. *Railway Company* v. *Sayles,* 97 U. S. 554. The defendant adopts another form. Under such circumstances the Todd patent cannot be extended so as to embrace the defendant's form."

If it were only to find a strong case in point the argument might stop here. The deck of an ore concentrator is as purely a matter of form (configuration) as the surface of a washboard. The statement of the Supreme Court that its prior decision in *Railway* v. *Sayles* is to be taken as controlling in the washboard

case would well support the argument that it must also be taken as controlling in cases relating to the decks of ore concentrators. But we are dealing with a class of inventions of peculiar character, inventions which, as we shall undertake to show, occupy a field by themselves unlike any other field of invention, and one in which Justice Bradley's theorem has a peculiar and controlling authority.

Parsons v. *Colgate,* 15 Fed. 600. The suit was on a patent for an improved soap. The soap was made from a product of petroleum. Others had made soap from petroleum before him. The court turned him down in these words, on page 604:

> Had he been the first discoverer of the use of petroleum products in soap, he might, perhaps, by this patent, cover every form of such use of everything known as residuum not actually charred in this art; but as he was not, he is only entitled at the most to the particular *form* which he discovered the use of and patented. *Railway* v. *Sayles,* 97 U. S. 554.

Strobridge v. *Smith Wooden-Ware Co.,* 46 Fed. 922. The suit was on a patent for an improvement in coffee mills. The patentee was not a pioneer in that art. After pointing out that fact, the court said in the opinion, on page 924:

> Furthermore, Strobridge was not the first to devise a coffee-mill with the hopper suspended within the box. Such mills had already been in public use and upon sale. Strobridge was no more than a mere improver of an old mechanism, and therefore entitled only to his own specific *form* of device. *Rail-*

way Co. v. *Sayles,* 97 U. S. 554; *Duff* v. *Pump Co.,* 107 U. S. 637, 2 Sup. Ct. Rep. 487.

Adams Elec. Ry. Co. v. *Lindell Ry. Co.,* 77 Fed., 432. (U. S. C. C. A., Eighth Circuit). The suit was for alleged infringement of a patent for improvement in electric motors. The improvement claimed was in means for mounting an electric motor on a car. After an extended review of the history of the art the court said, on page 440 of the report:

> One who invents and secures a patent for a machine or combination which first performs a useful function is protected thereby against all machines and combinations which perform the same function by equivalent mechanical devices; but one who merely makes and secures a patent for a slight improvement on a device or combination, which performs the same function before as after the improvement, is protected against those only who use the very improvement that he describes and claims, or mere colorable evasions of it. If one inventor precedes all the rest, and strikes out something which includes and underlies all that they produce, he acquires a monopoly, and subjects them to tribute. But if the advance towards the thing desired is gradual, and proceeds step by step, so that no one can claim the complete whole, then each is entitled only to the specific form of device which he produces, and every other inventor is entitled to his own specific form, so long as it differs from those of his competitors, and does not include theirs. *Railway Co.* v. *Sayles,* 97 U. S. 554, 556.

After an extended discussion of the art the court on page 448 made this application of the principle enunciated in *Railway Co.* v. *Sayles:*

> These facts have borne the conclusion in upon our minds with compelling force that Adams cannot be held to be a pioneer inventor, nor his patent to be of primary character, in the art of mounting electric motors to propel cars. This is not a case where Adams preceded all the rest, and struck out something which included and underlay all that they produced. It is a case in which the principle to be applied, and the mechanical elements to be used, were all old and well known. Many minds were independently striving to accomplish the same purpose. Adams formed and patented one combination. Edison, Finley, and Sprague devised and used others. Each is entitled to his own form so long as it differs from that of his competitors and does not include theirs, and neither is entitled to subject to tribute those whose combinations are not mere evasions of his own. The franchise of Adams was limited by the state of the art to the specific combination he described and claimed in his patent, and to palpable evasions of it.

Corser v. *Brattleboro Overall Co.,* 93 Fed. 805. Suit was for infringement of patent for improvement in overalls. The court said on pages 806-7:

> As overalls, and overall backs and fronts, and suspenders, wide and otherwise, were all old, the plaintiff could have a valid patent only for his specific improvements upon them in these respects. *Railway Co.* v. *Sayles* 97 U. S. 554.

Diamond Rubber Co. v. *Consol. Rubber Tire Co.,* 220 U. S., 428. This was the hard-fought Grant Rubber Tire case—one of the few cases to reach the Supreme Court by *certiorari.* The patent was sus-

tained. But in the course of the opinion the court, on page 435, refers to *Railway Co.* v. *Sayles* with this recognition of the principle established by it:

> In other words, the invention may be broadly new, subjecting all that comes after it to tribute (*Railway Co.* v. *Sayles,* 97 U. S., 554, 556); it may be the successor, in a sense, of all that went before, a step only in the march of improvement, and limited, therefore, to its precise form and elements, as the patent in suit is conceded to be."

We have been standing mainly, so far, on the authority of *Railway* v. *Sayles* and cases which expressly follow it and refer to it. And certainly those cases are a sufficient foundation to build an argument on. Take it all in all, *Railway* v. *Sayles* is undoubtedly the greatest patent case in the reports. But the principle of restricting improvement patents to a narrow application of their claims was not original with that case. It runs far back into the history of the law. The leading case, so far as our researches have gone, is *McCormick* v. *Talcott,* 20 Howard 402, decided in 1857. The suit was upon a patent for a device called a "divider" employed in a reaping machine to separate the standing grain from that in the path of the machine, so that the stalks to be cut would not be entangled with those to be left standing. The question to be decided and the principle to be applied in deciding it are thus stated by the court on pages 404-5 of the report:

> "In order to ascertain whether the divider used by defendants infringes that of the complainant, we must first inquire whether Mc-

> Cormick was the first to invent the machine called a divider, performing the functions required, or has merely improved a known machine by some peculiar combination of mechanical devices which perform the same functions in a better manner."
>
> "If he be the original inventor of the device or machine called the divider, he will have a right to treat as infringers all who make dividers operating on the same principle, and performing the same functions by analogous means or equivalent combinations, even though the infringing machine may be an improvement of the original, and patentable as such. But if the invention claimed be itself but an improvement on a known machine by a mere change of form or combination of parts, the patentee cannot treat another as an infringer who has improved the original machine by use of a different form or combination performing the same functions. The inventor of the first improvement cannot invoke the doctrine of equivalents to suppress all other improvements which are not mere colorable evasions of the first."

Following this statement of the principle to be applied the court pointed out that dividers performing the same function as McCormick's were known prior to his invention so that he had the standing only of an improver of an old art, and the judgment of the lower court for the defendants was affirmed.

In *Burr* v. *Duryee,* 1 Wall., 531 (1863) the court, in the course of the opinion, on page 573, quoted with approval the last two sentences of the extract copied above from *McCormick* v. *Talcott.*

Burden v. *Corning,* 2 Fish. Pat. Cas., 477; s. c. 4 Fed. Cas. No. 2143. (1864).

The suit was for infringement of a patent for a machine for making horse shoes. In the opinion of the court seven patents in England and the United States for machines accomplishing the same result are referred to. One of these was a U. S. patent to Young and Titus. The defendants claimed that the machines made by them were substantially like the Young and Titus machine with some modifications. Speaking of the rights of subsequent improvers of Young and Titus, the Court said on page 707 of the report in 4 Fed. Cases:

> "The patentee of the first of such inventions could not treat another as an infringer, because he had improved the machine of Young and Titus, or that of any other prior inventor, by the use of a substantially different device, or a substantially different combination of parts, though such device or combination were capable of performing the same functions. In such cases, the inventor of the first improvement can not invoke the doctrine of equivalents to suppress other improvements which are not mere colorable evasions of the first: *McCormick* v. *Talcott,* 20 How. (61 U. S.) 402, 405."

Hill v. *Sawyer,* 31 Fed. 282. (1887).

The patent was for an improvement in dating stamps. The question was a close one. The decision was by Judge Coxe in 1887. He has grown to be a great judge since then. In the opening of his opinion he said on page 284:

> "Do the defendants infringe? This question is a perplexing one, and the solution of it is surrounded by unusual difficulties. An examination of the authorities in analogous cases, however, has confirmed and strength-

> ened the impression formed at the argument that the defendants do not infringe. The construction placed upon the claim, in view of the restricted theater of operation, must necessarily be a narrow one."

His final conclusion was in these words, on page 285:

> "Nevertheless the defendants' rolls are not the rolls of the patent, and, although they produce similar results, they cannot be regarded as equivalents. This case, it is thought, belongs to that class of inventions where the doctrine of equivalents cannot be invoked to suppress improvements on a well known machine. Where change of form or combination only is involved, each inventor must be content with the structure described and claimed by him. *McCormick* v. *Talcott,* 20 How. 402."

Bragg et al. v. *Fitch,* 121 U. S. 478. (1887).

The patent in suit was for an improvement in harness hooks or snaps. After showing that devices of that kind were old and had been made in many forms, the court said, on page 830:

> "It is obvious from the foregoing review of prior patents that the invention of Bristol, if his snaphook contains a patentable invention, is but one in a series of improvements all having the same general object and purpose, and that in construing the claims of his patent they must be restricted to the precise form and arrangement of parts described in his specification, and to the purpose indicated therein."

Parry Mfg. Co. v. *Hitchcock Mfg. Co.,* 58 Fed. 402. (1893).

Suit for infringement of a patent for improvements in sulky road wagons. The court said on page 403:

> "The field of invention is exceedingly narrow. For centuries improvements in vehicles drawn by animals have been going on in both hemispheres. It is manifest that a broad invention in this art is well nigh impossible. Improvements may be made from time to time, but patents therefor must be strictly construed and the claims limited to the precise advances made by the inventor. *McCormick* v. *Talcott,* 20 How., 402."

In *Whitmun* v. *Seaman et al.,* 4 Fed., 436, the suit was on a patent for improvement in coal scuttles. The court said, on pages 436-7:

> "As the orator is not the inventor of coal-scuttles, nor of anything underlying the whole structure, his patent cannot be construed as covering the whole, but must be restricted to the particular construction invented by him in order to stand at all. *Railway Co.* v. *Sayles,* 97 U. S., 554."

In *McMurry et al.* v. *Mallory & Co.,* 5 Fed., 593, the suit was on two patents for improvements in soldering irons. It was an old art and many forms of soldering irons had been made. The court said in the opinion, on page 598:

> "The conclusion to which I have come is that the two patents on which the complainants base their claims are for combinations in which the *form* of the instrument is of the essence of the invention, and that the complainants are entitled only to substantially that *form* of instrument which, in his specifications and drawings, the patentee under whom they

claim has shown. *Railway Co.* v. *Sayles,* 97 U. S. 556."

The bill was dismissed.

In *Falls Rivet Co.* v. *Wolfe et al.,* 40 Fed., 465, decision by Judges MCKENNAN and ACHESON, the case was a suit for infringement of a patent for improvement in friction clutches. The device was a very old one. The court expresses the opinion on page 466 of the report that probably 300 patents had been granted on such devices. In the conclusion of the opinion the court said, on page 470:

> "Finally, it is very clear that Brock's invention is not of a primary character. He was a mere improver of an old device. This field of invention had been thoroughly worked over before Brock entered it. At the most he took but a single step forward. Treating him, then, as an inventor, the case, we think, fairly comes within the principle stated in *Railway Co.* v. *Sayles,* 97 U. S., 554, 556, 557; 'but if the advance towards the thing desired is gradual, and proceeds step by step, so that no one can claim the complete whole, then each is entitled only to the specific form of device which he produces, and every other inventor is entitled to his own specific form, so long as it differs from those of his competitors, and does not include theirs.' "

The bill was dismissed.

In *Ginna* v. *Mersereau Mfg. Co.,* 69 Fed., 344, the suit was for infringement of a patent for improvement in machines for the manufacture of tin cans. The decision was rendered by Judge ACHESON. The art was an old one. After pointing that out, the court said, on page 346:

> "The relation of Hipperling to the art of double seaming cans of rectangular shape was that of an improver only, and therefore he must be confined to his own form of construction. *Railway Co.* v. *Sayles,* 97 U. S. 554."

The bill was dismissed.

Union Writing Mach. Co. v. *Domestic Sewing Mach. Co.,* 95 Fed., 140, was on a patent for improvements in typewriting machines. The court said, on page 144:

> "Upon a thorough examination of the proofs, I am entirely satisfied that, in view of the state of the art at the time of the invention in question, the plaintiff's case falls within that class of patents in which the inventor is to be limited to his own precise devices and held rigidly to his claims. *Railway Co.,* v. *Sayles,* 97 U. S., 554."

The bill was dismissed.

In the very recent case of *Johnson* v. *Johnson,* 190 Fed., 20, (1911), the suit was for alleged infringement of patent to the plaintiff for improvement in tennis court markers. The defendant had a patent also, two years later in date, for apparatus for the same purpose. After pointing out that other devices for the same use had been patented, both in this country and in England, long before, so that both the Johnsons were improvers only, the court stated the rule of law applicable to the case as follows, on page 25 of the report:

> "The law is well settled that where the patents sued on are not pioneer patents, and do not embody a primary invention, but are only improvements on the prior art, and de-

> fendant's machines can be differentiated, the charge of infringement cannot be maintained."

This is a remarkable series of cases. It reaches from 1857 to 1911. Like links in a chain they follow one another from the first to the last. What is their meaning? They have a deep one for this case. To find it will involve a little study of the foundation and development of our patent system.

Section 8 of Article I of the Constitution of the United States provides that Congress shall have power "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

It is to be noted that the thing to which patentees are to have exclusive rights is *their discoveries.*

The statutes which give effect to this provision are as follows:

Section 4884, R. S., is in these words:

> "Every patent shall contain a short title or description of the invention or discovery correctly indicating its nature and design, and a grant to the patentee, his heirs or assigns for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the territories thereof, referring to the specification for the particulars thereof. A copy of the specification and drawing shall be annexed to the patent and be a part thereof."

The right conferred is to make, use and vend the *invention or discovery.*

Section 4888, R. S., is in these words:

> "Before any inventor or discoverer shall receive a patent for his invention or discovery, he shall make application therefor in writing to the Commissioner of Patents, and shall file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains or with which it is most nearly connected, to make, construct, compound and use the same; and in case of a machine, he shall explain the principle, thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions; and he shall particularly point out and distinctly claim, the part, improvement, or combination which he claims as his invention or discovery. The specification and claim shall be signed by the inventor and attested by two witnesses.

This requires the inventor to *describe his invention* minutely.

Section 4893, R. S., is in these words:

> "On the filing of any such application and the payment of the fees required by law, the Commissioner of Patents shall cause an examination to be made of the alleged new invention or discovery; and if on such examination it shall appear that the claimant is justly entitled to a patent under the law and that the same is sufficiently useful and important, the Commissioner shall issue a patent therefor."

The issue of the patent is therefore a finding by the Commissioner that the invention described in the

patent is useful and important, or, as the phrase goes, "new and useful."

None of these provisions of the statute confers upon a patentee any exclusive right except to the *invention described in his specification.* Taken literally that would mean the very thing—the exact thing described in the specification. In every case of controversy about what the words of a specification are to be taken to mean, the question is one for judicial intervention. The courts must settle all such disputes. It has happened that the disputes have been innumerable and the decisions relating to them form a body of adjudications hardly second in number to that in any other department of jurisprudence, all designed to administer the patent law fairly between patentees and the public. It has followed out of this situation that the *decisions of the courts constitute the patent law of the United States.* When we want to know what that law is we must go there to find it.

It is one of the beneficent features of the evolution of bench made law that it tends to development of principles. Of these the most important one in the patent law resting on adjudication is that which establishes the distinction between pioneer inventions and improvement inventions. A pioneer invention is one in which, in the language of the Supreme Court, "one inventor precedes all the rest and strikes out something which includes and underlies all that they produce." After him the field is open to others to make improvements in the machine, or apparatus, or process covered by his invention. But all those improvements are in-

fringements of the pioneer, or primary patent. As the Supreme Court goes immediately on to say in the decision just quoted from, "he acquires a monopoly and subjects them to tribute."

Then comes the question: What are the rights of the improvers among themselves and as against one another? The Supreme Court again gives this answer: "Then each is entitled only to *the specific form of device which he produces, and every other inventor is entitled to his own specific form,* so long as it differs from those of his competitors and does not include theirs."

There is no end to refinements in the application of a rule of this kind. "Only to the specific form of device which he produces." Does that mean exactly what it says? Does it mean that the monopoly of an improvement patent is limited to the very identical thing described in it? The answer to this question is to be found in the collation and comparison of decisions relating to improvement patents, such as we have made in the chain of cases cited in the preceding pages.

Some of these cases limit the monopoly of improvement patents to the exact invention described in the specification. One says that the claim of the patent must be restricted to the "precise form" described in the specification; another that the charge of infringement cannot be maintained if the defendant's machine can be "differentiated;" another that the patent must be limited "to the specific combination" described in it, and so on. How shall we present these cases in such way as to express as nearly as possible the full

force of all of them in the fewest possible words' We know of no way to do it except by a sort of conspectus which shall give in the words of the judge delivering the opinion his own final statement of the point of the decision. That will be authoritative, and we can make it concise. We have, therefore, compiled the following:

CONSPECTUS OF THE DECISIONS

RAILWAY v. SAYLES AND CASES FOLLOWING IT.

Railway v. *Sayles,* 97 U. S., 554, 561. Railway Brakes.

> "They invented a particular apparatus for doing the desired work; and *they can only claim their particular apparatus, or that which is substantially the same.*"

Duff v. *Sterling Pump Co.,* 107 U. S., 636. Wash-boards.

> *"He merely devised a new form to accomplish these results. The defendant adopts another form."*

Strobridge v. *Smith W. W. Co.,* 46 Fed., 922, 924, Coffee-Mill.

> *"Entitled only to his own specific form of device."*

Adams E. Ry. Co. v. *Lindell Ry. Co.,* 77 Fed., 432, 448, Elec. Motor.

> *"The specific combination he described and claimed in his patent and to palpable evasions of it."*

Corser v. *Brattleboro O. Co.,* 93 Fed., 805, 806-7. Overalls.

> "The plaintiff could have a valid patent

only for his specific improvements upon them in these respects."

Diamond Rub. Co. v. *Consol, R. T. Co.,* 220 U. S., 428, 435. Rubber Tires.

"A step only in the march of improvement, *and limited, therefore, to its precise form and elements."*

Whitman v. *Seaman,* 4 Fed., 426-7. Coal-scuttles.

"Must be restricted to the *particular construction invented by him in order to stand at all."*

McMurry v. *Mallory & Co.,* 5 Fed., 593, 598. Soldering irons.

"Entitled only to substantially that *form of instrument which the patentee has shown."*

Falls Rivet Co. v. *Wolfe,* 40 Fed., 465, 470. Friction clutches.

"Brock was a mere improver of an old device: he took but a single step forward and *is entitled only to the specific form of device which he produced."*

Ginna v. *Mersersau,* 69 Fed., 344, 346. Machine for manufacture of tin cans.

"The relation of Hipperling to the art of double seaming cans of rectangular shape was that of an improver only, and therefore *he must be confined to his own form of construction."*

Union Writing Mach. Co. v. *Domestic Sewing Mach. Co.,* 95 Fed., 140, 144. Typewriting machines.

"In view of the state of the art at the time of the invention the inventor is to *be limited to his own precise devices, and held rigidly to his claims."*

McCormick v. Talcott, 20 *How.,* 402, 404-5. Reaper Divider.

> "The inventor of the first improvement cannot invoke the doctrine of equivalents to suppress all other improvements *which are not mere colorable evasions of the first.*"

Burden v. *Corning,* 4 Fed. Cas., No. 2143. Horseshoe Machine.

> "In such cases the inventor of the first improvement can not invoke the doctrine of equivalents to suppress other improvements which are not *mere colorable evasions of the first.*"

Hill v. *Sawyer,* 31 Fed., 282, 285. Dating Stamps.

> "Where change of form or combination only is involved *each inventor must be content with the structure described and claimed by him.*"

Bragg v. *Fitch,* 121 U. S., 478, 483. Harness Hooks or Snaps.

> *"In construing the claims of his patent they must be restricted to the precise form and arrangement of parts described in his specification.*"

Parry Mfg. Co. v. *Hitchcock Mfg. Co.,* 58 Fed. 402, 403. Sulky Road Wagon.

> "Improvements may be made from time to time, but patents therefor must be strictly construed, *and claims limited to the precise advances made by the inventor.*"

Johnson v. *Johnson,* 190 Fed., 20, 25. Tennis Court Marker.

> Where the patent "is only an improvement on the prior art and *defendant's machine can*

be differentiated the charge of infringement can not be maintained."

The problem now is to give such effect to these authorities as they ought to have in this case. They cannot be ignored. As we have pointed out, the decisions of the courts are the sole repository of the patent law in its practical administration. The statute furnishes only the bare skeleton. The growth of the patent law in this country has had a striking similarity to the growth, on a longer and larger scale, of the common law of England. It has been built up on one decision after another. The cases we have cited relate mostly to little things which have been the subject of many inventions, such as washboards; coffee mills; overalls; coal scuttles; soldering irons; friction clutches dating stamps and harness hooks. But, of course, a large machine may have patented improvements in small features. In the above list is a machine for making tin cans; a type writing machine, and one for making horse shoes, to all which the same principle applies. If a patentee should come into this court as a suitor on a patent for a suspender buckle and it should appear that suspender buckles had been the subject of many prior patents, would not the court follow these authorities and hold him down close to his own construction?

What sort of inventions are concentrating tables? Do these cases apply to them? An answer will require a little study of the field. We ought to know something of the number and variety of ore concentrators and ore concentrator patents. As to the number of patents no

man can tell. There is no such class as ore concentrators apart from "Washers" in the classification of the Patent Office. We know there are a great many of them—many hundreds, doubtless, and more coming. The most useful help we can render the court on this point by anything we can put in a brief will be to insert here illustrations of some of them. We will make it eighteen because we happen to have that many cuts within our reach. They may be taken as samples of the whole. They show for themselves what they are. Each one is a zincograph of a patent drawing. Some of the patents are in the record, and some are not. But that does not matter. They are not offered as anticipations of anything, but as mere illustrations of the general character of the field. On page 47 of the record there is a list of 15 patents referred to in the answer as prior to Wilfley; and on page 50 a supplementary list of 6 more in an amendment of the answer. All these were put in as evidence and a number of them are in the printed record from page 309 to 359. The following reproductions include some of them and some others.

(No Model.) 2 Sheets—Sheet 1.

A. BLATCHLY & G. KUSTEL.

ORE CONCENTRATOR.

No. 258,879. Patented June 6, 1882.

Fig. 1

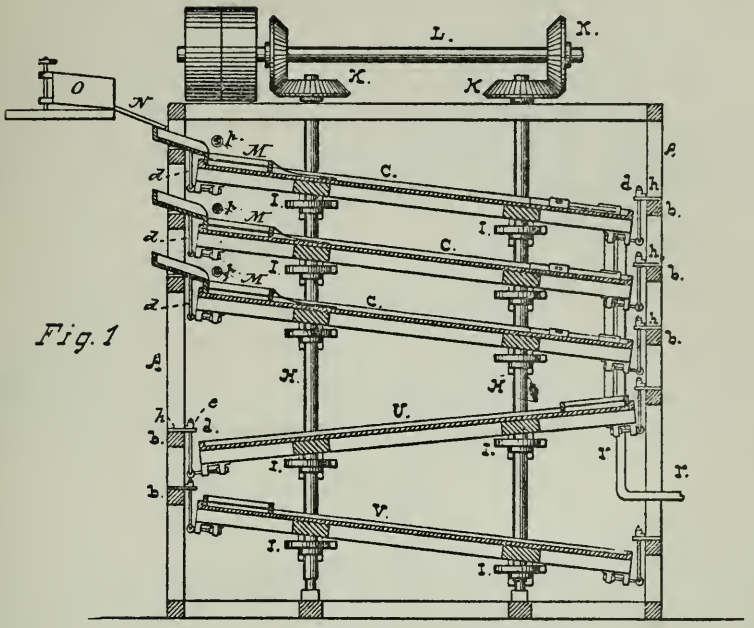
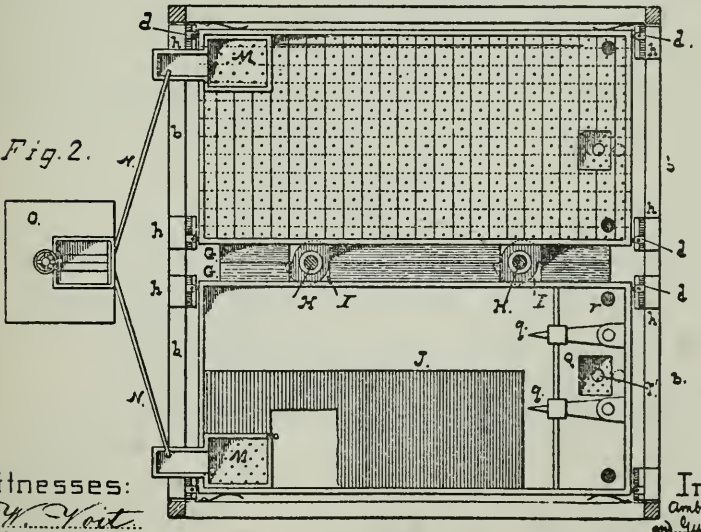


Fig. 2.



Witnesses:
W. Voit.
E. W. Clark.

Inventors
Ambrose Blatchly
and Guido Kustel
Pyrmont Alley, Dean & Dean

(No Model.)

H. C. KRAUSE.

ORE SEPARATOR.

No. 349,504. Patented Sept. 21, 1886.

Fig. 1.

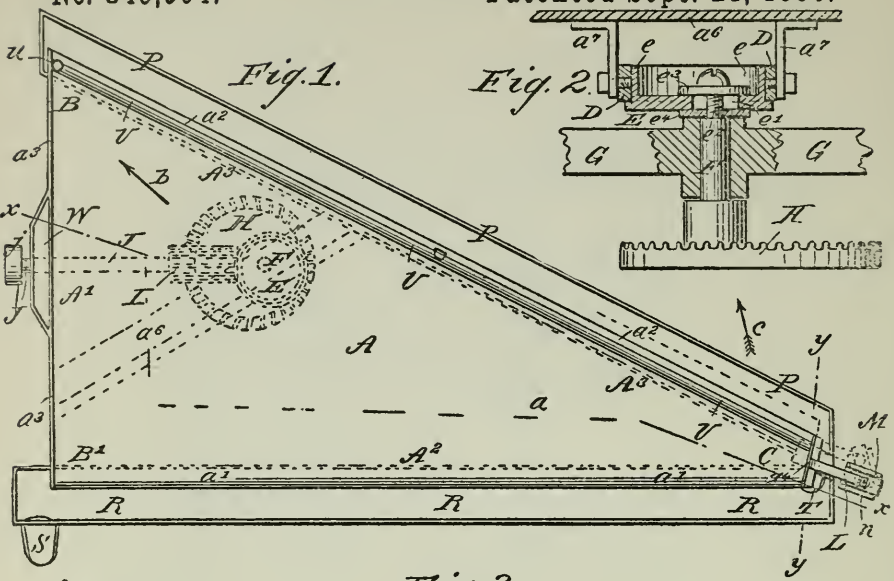


Fig. 2.

Fig. 3.

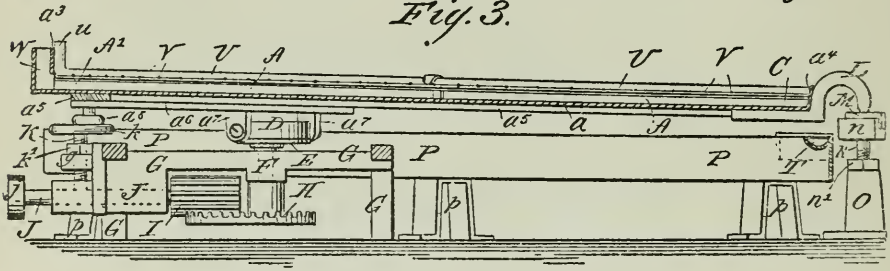


Fig. 4.

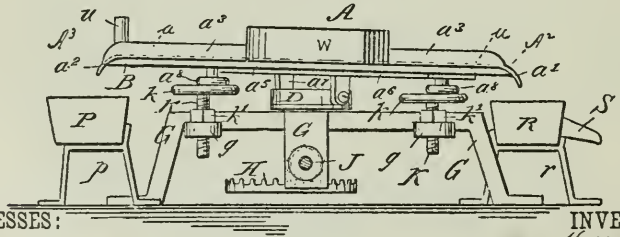
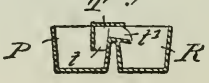


Fig. 5.



WITNESSES:

Geo. Tuttchell

C. Sedgwick

INVENTOR:

H. C. Krause

BY Munn & Co.

ATTORNEYS.

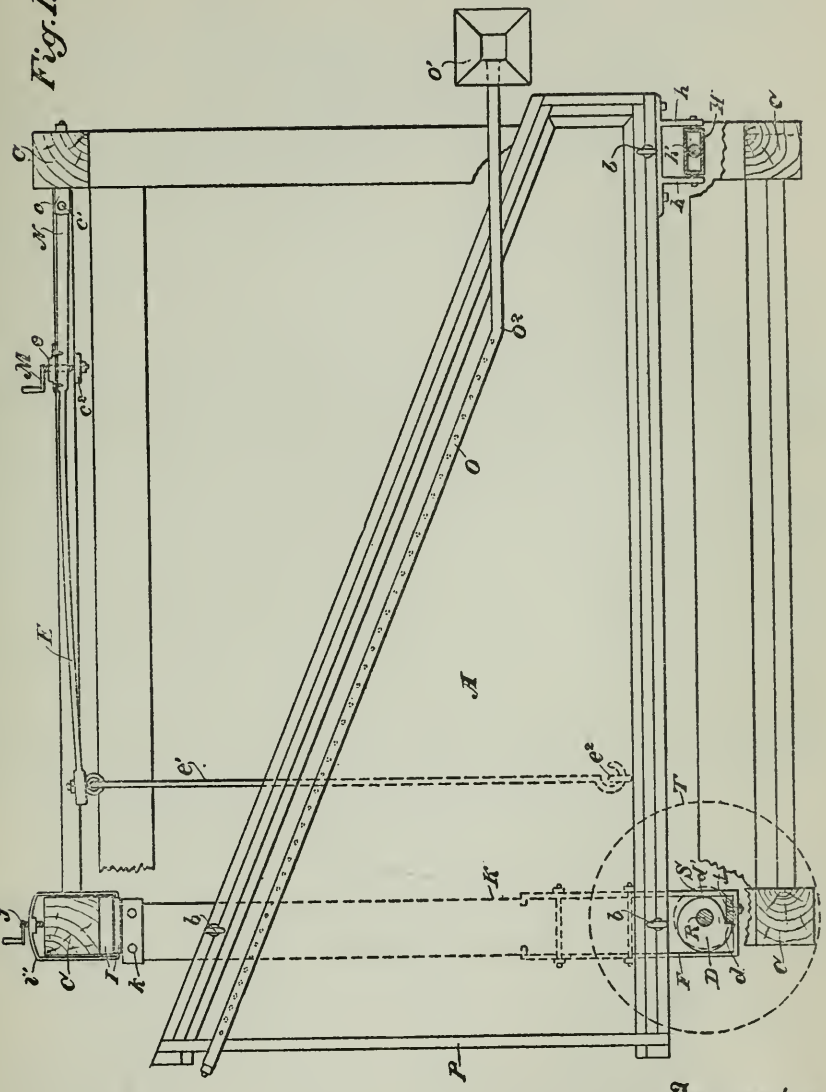
(No Model.) 2 Sheets—Sheet 1.

L. LOOK.

ORE CONCENTRATOR.

No. 526,242. Patented Sept. 18, 1894.

Fig. 1.



Witnesses.
J. L. Bruise
H. F. Ascheck

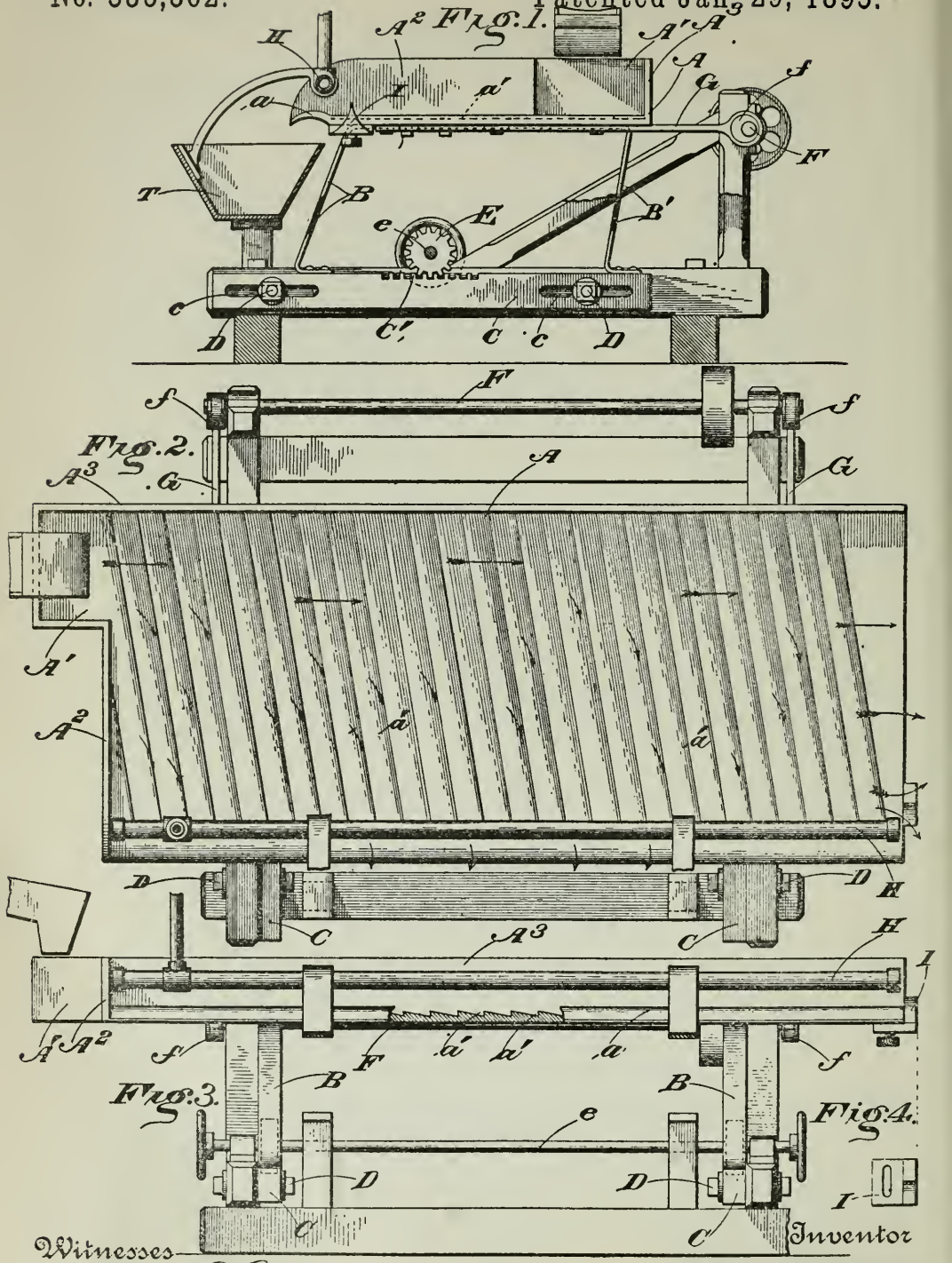
Inventor
Luther Look
By Dewey & Co.
Attys

(No Model.)

J. LAMPERT.

CONCENTRATOR.

No. 533,362. Patented Jan. 29, 1895.



Witnesses
M. E. Fowler.
James R. Mansfield.

Inventor
Jacob Lampert
by Alexander & Dowell.
Attorneys

No. 641,977. Patented Jan. 23, 1900.

J. LAMPERT.

ORE CONCENTRATOR.

(Application filed Mar. 16, 1899.)

(No Model.) 4 Sheets—Sheet 1

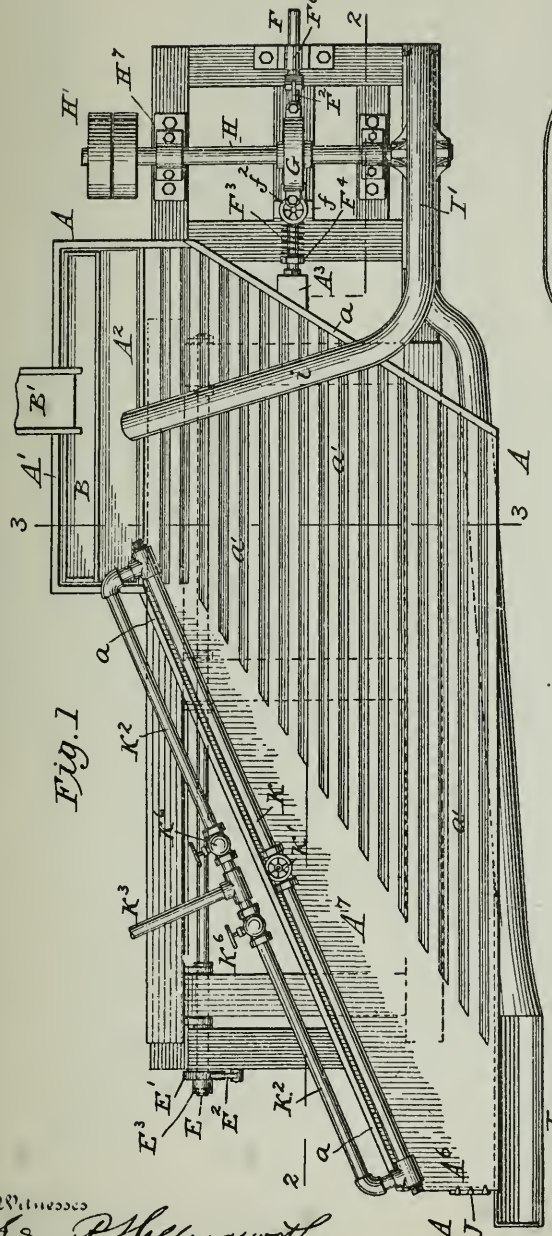


Fig. 1

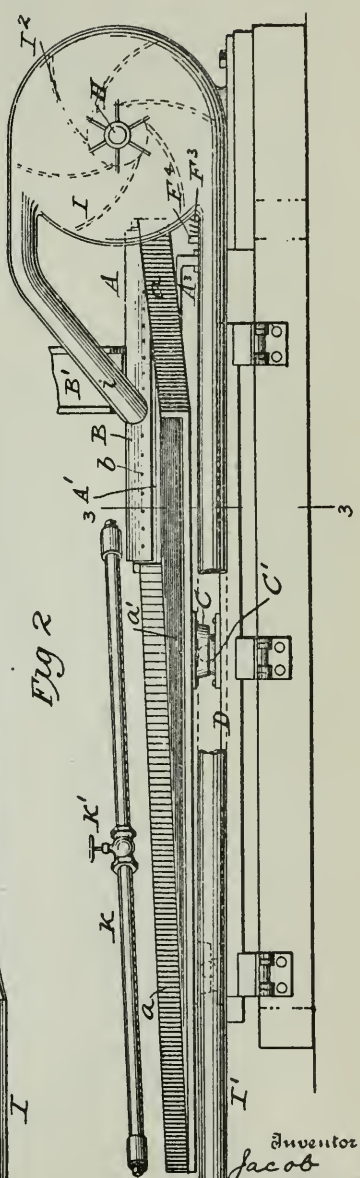


Fig 2

Witnesses
Sidney P. Hollingsworth
James R. Mansfield

Inventor
Jacob Lampert
By
Alexander & Dowell
Attorneys

No. 661,886.

Patented Nov. 13, 1900.

I. F. MONELL.

CONCENTRATING TABLE.

(Application filed June 9, 1899.)

(No Model.)

2 Sheets—Sheet 2.

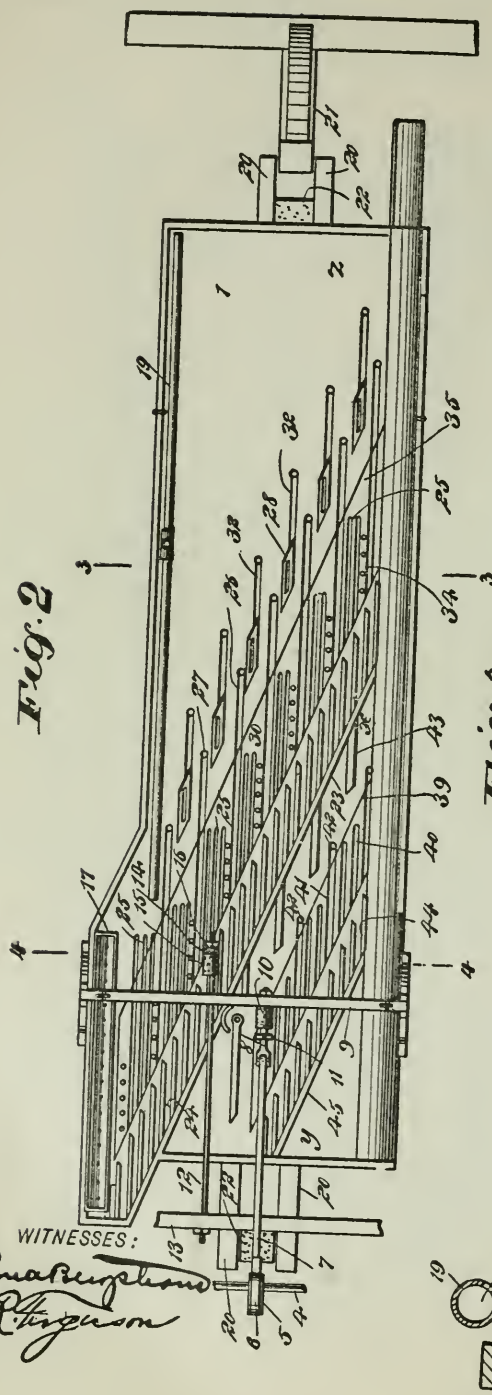


Fig. 2

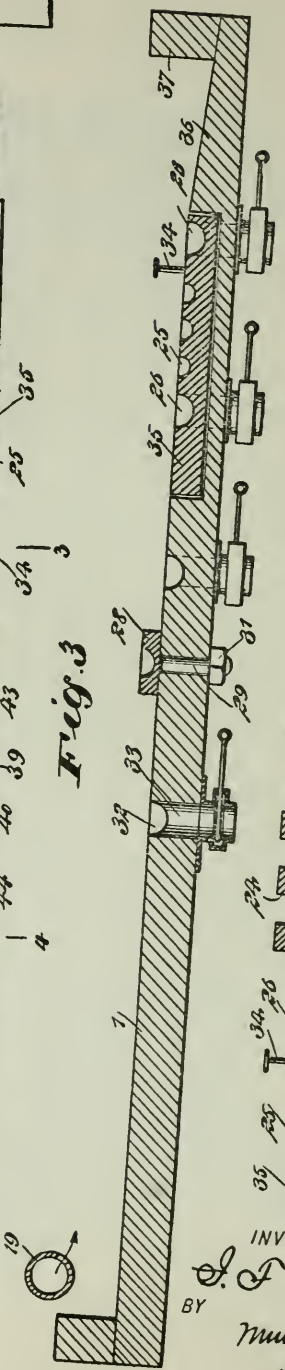


Fig. 3

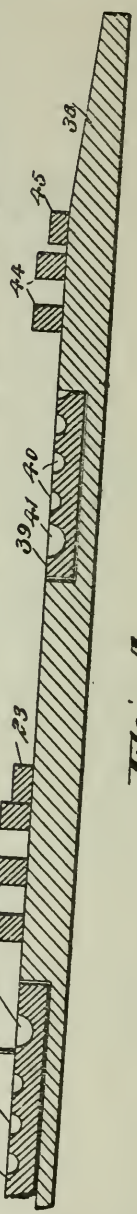


Fig. 4

WITNESSES:

John A. Brayton

R. Ferguson

INVENTOR

I. F. Monell

BY

Munn & Co.

ATTORNEYS

No. 682,371. Patented Sept. 10, 1901.

H. P. TAYLOR.

ORE CONCENTRATOR.

(Application filed Jan. 7, 1901.)

(No Model.) 2 Sheets—Sheet 1.

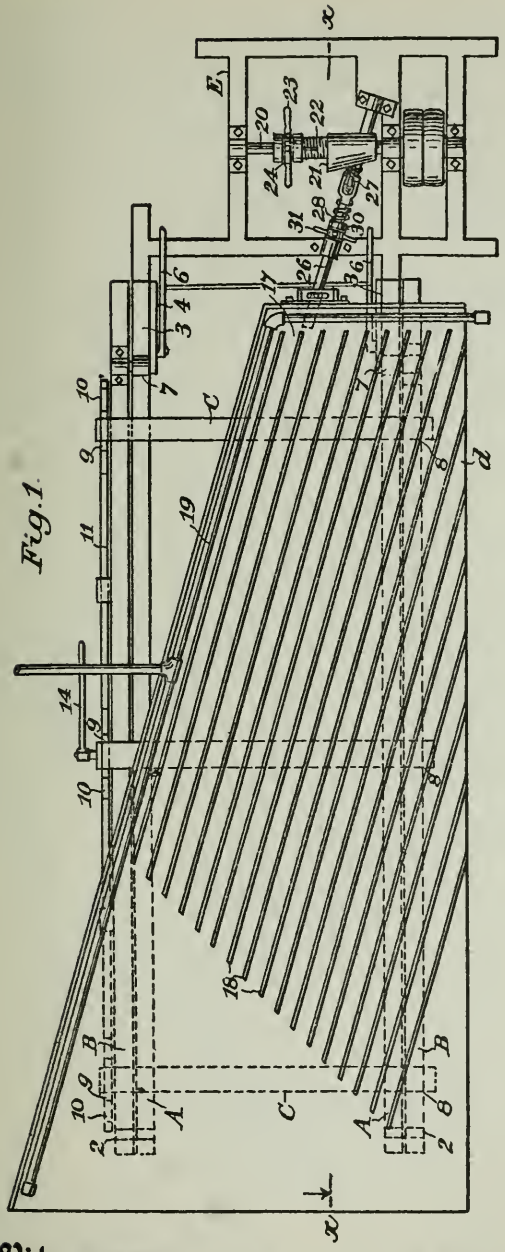


Fig. 1.

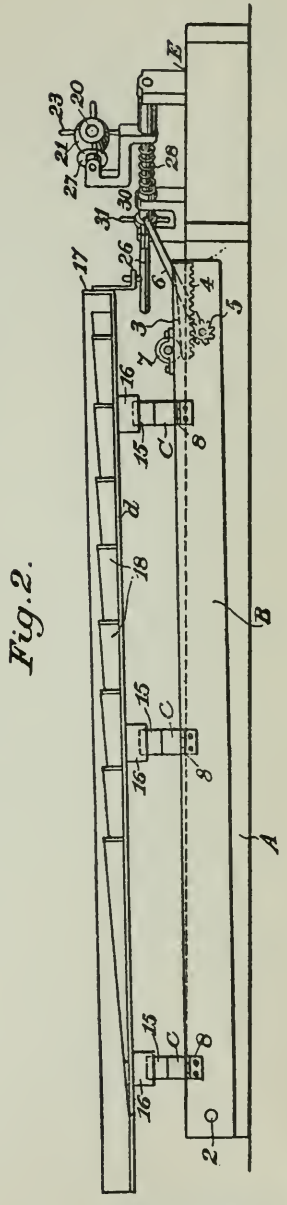


Fig. 2.

Witnesses,
E. A. Brandau,
J. L. Amrei.

Inventor,
Harry P. Taylor
By Dewey Thompson & Co.
Attys

No. 687,908

Patented Dec. 3, 1901.

S. W. TRAYLOR.

CONCENTRATOR.

(Application filed Jan. 16, 1901.)

(No Model.)

2 Sheets—Sheet 1.

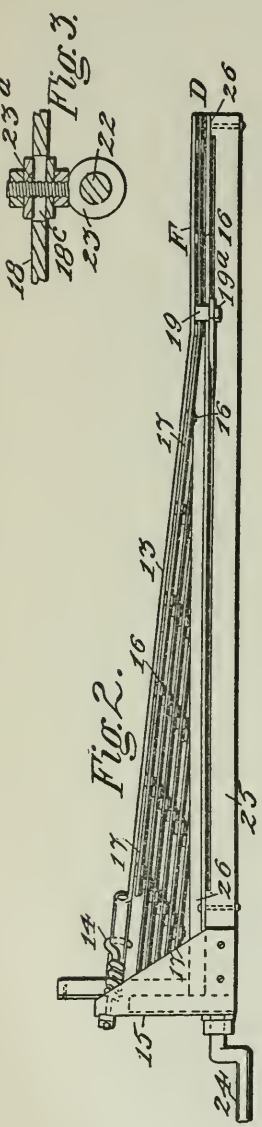


Fig. 2.

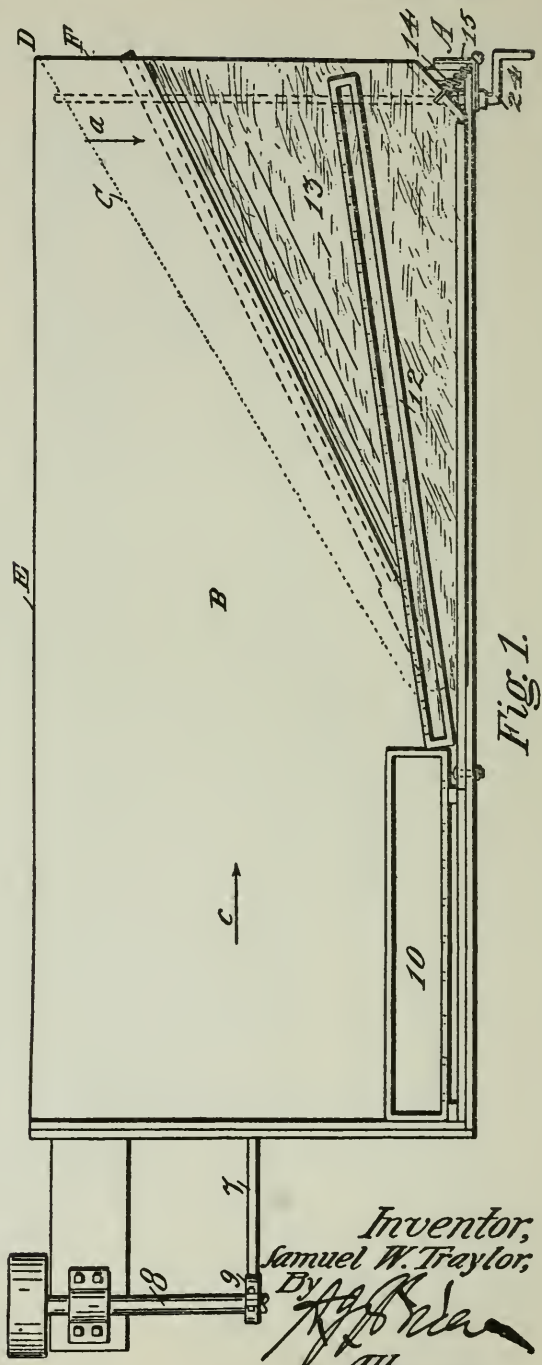


Fig. 1.

Witnesses,
H. M. Neff
Dora C. Shick

Inventor,
Samuel W. Traylor,
By
Attorney.

No. 660,342. Patented Oct. 23, 1900.

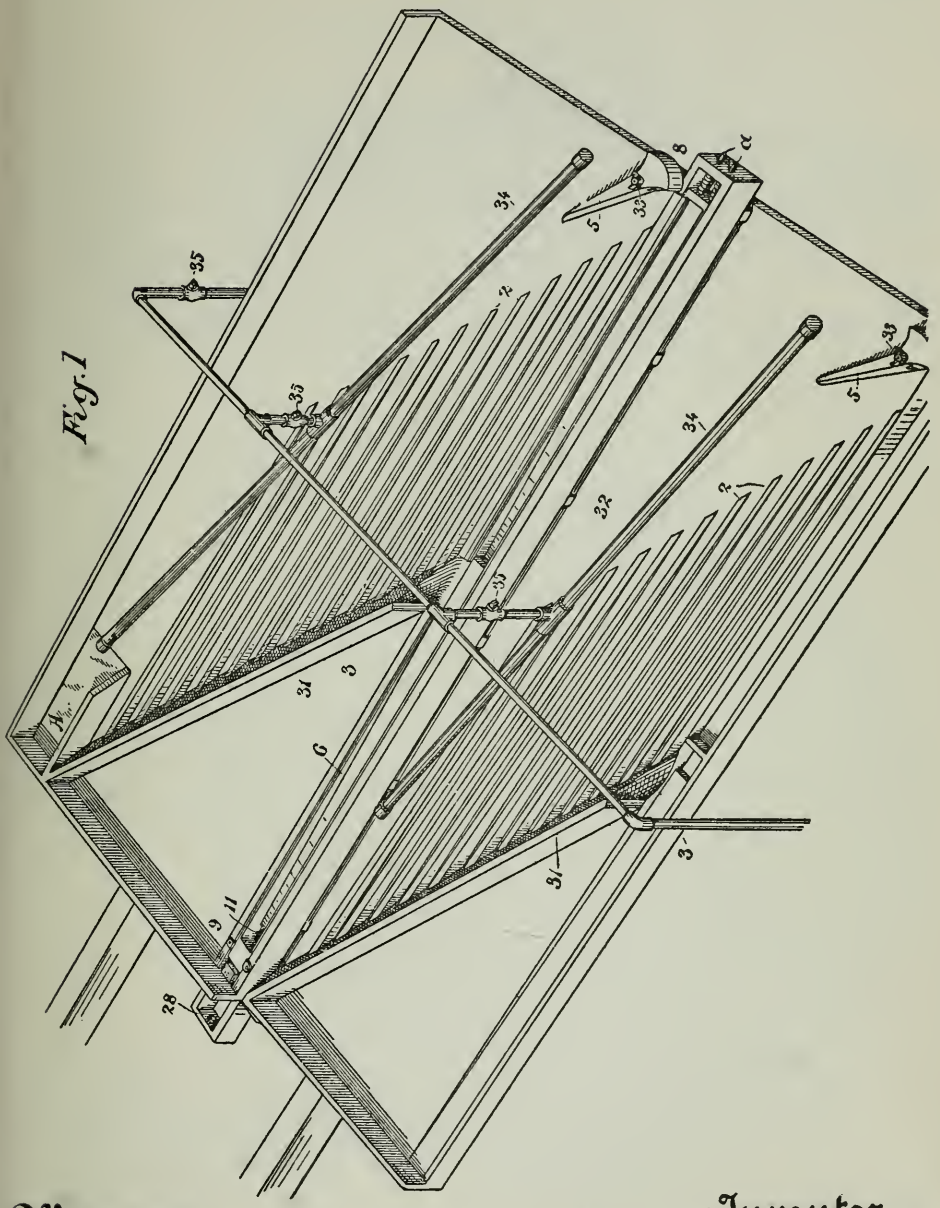
J. P. SMITH.

ORE SEPARATOR.

(Application filed Jan. 2, 1900.

(No Model.) 3 Sheets—Sheet 1.

Fig. 1



Witnesses,
J. F. Toms.
G. F. Ascheck

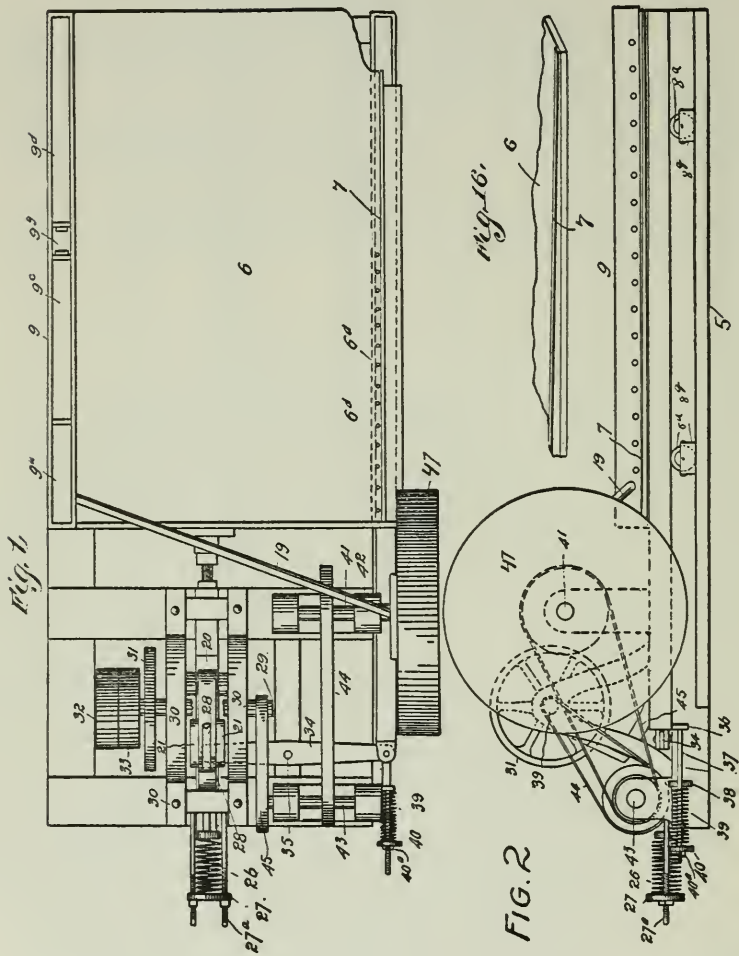
Inventor,
Jonathan P. Smith
by Dewey Strong & Co.
Atty

(No Model.) 4 Sheets—Sheet 1.

A. R. WILFLEY.

CONCENTRATOR.

No. 580,338. Patented Apr. 6, 1897



Witnesses
C. F. Clarence.
Edith Himsworth.

Inventor
A. R. Wilfley
By his Attorney
A. J. Wilfley

(No Model.) 2 Sheets—Sheet 2.

A. R. WILFLEY.

ORE CONCENTRATOR.

No. 590,675 Patented Sept. 28, 1897

FIG. 3.

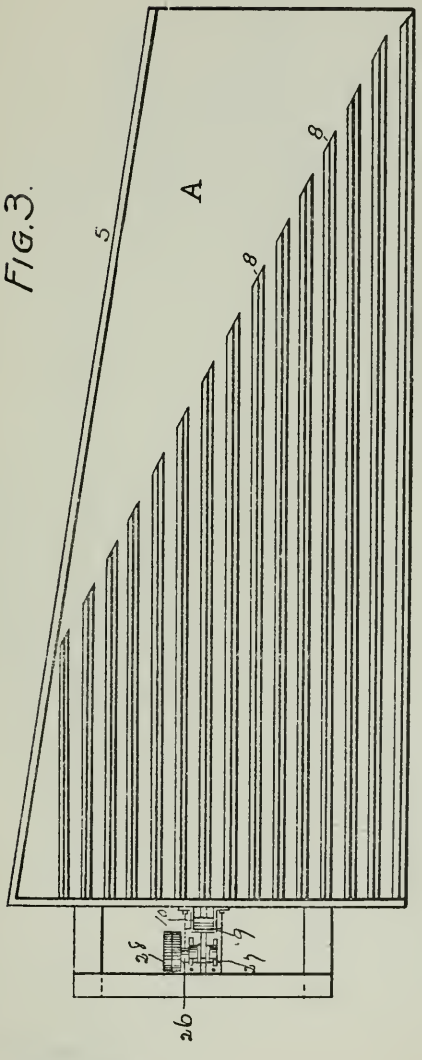
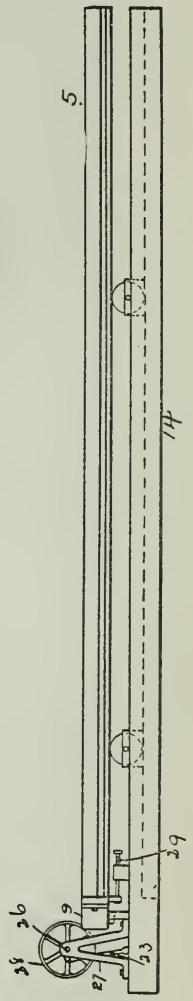


FIG. 4.



Witnesses
E. J. Boland
Edith Hinsworth

Inventor
A. R. Wilfley
By his Attorney
A. R. Wilfley

No. 632,892. Patented Sept. 12, 1899.

I. A. CAMMETT & F. E. SHEPARD.

ORE CONCENTRATOR.

(Application filed Oct. 12, 1898.)

(No Model.)

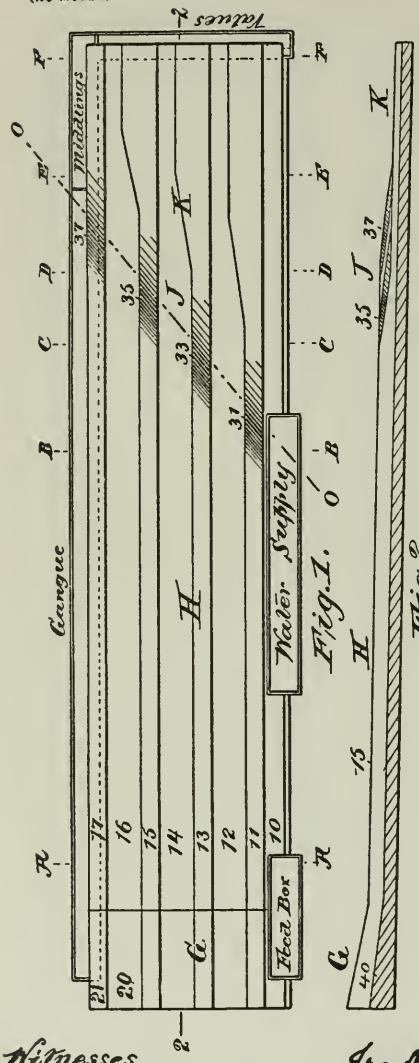


Fig. 1.

Fig. 2.

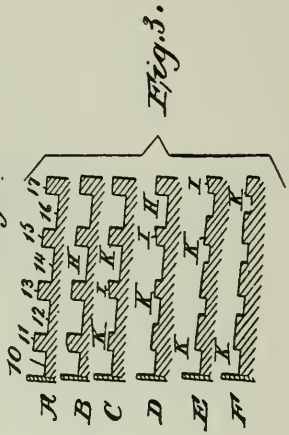


Fig. 3.

Witnesses,
G. W. Benjamin
Geo. H. Lonneborn.

Inventors,
Ira A. Cammett and Frank E. Shepard
By Wilkes & Bliss
Attys

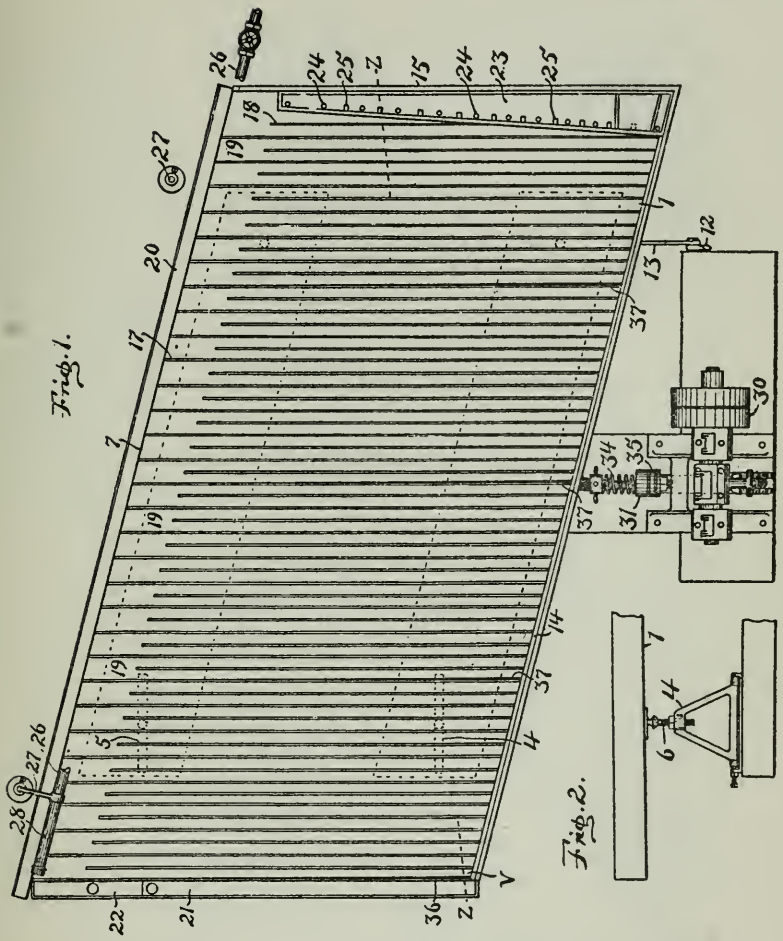
No. 895,167. PATENTED AUG. 4, 1908.

E. DEISTER.

ORE CONCENTRATOR.

APPLICATION FILED FEB. 19, 1906.

2 SHEETS—SHEET 1.



WITNESSES:

M. Mattler.

William H Brueman

Emil Deister INVENTOR

BY A. G. Burns

ATTORNEY

E. DEISTER.

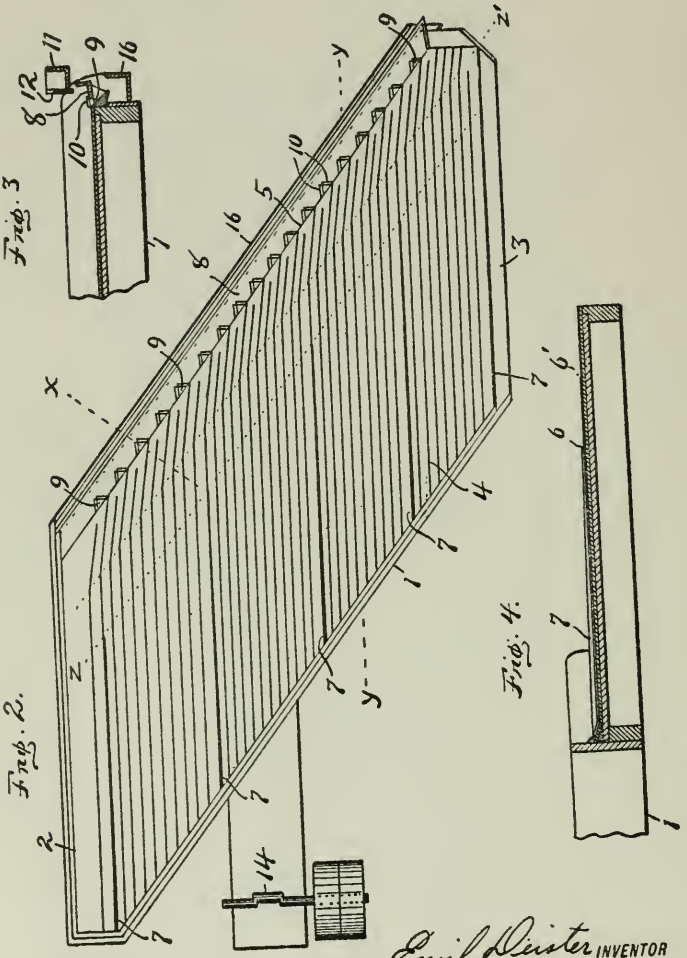
ORE CONCENTRATOR.

APPLICATION FILED JAN. 27, 1908.

1,044,030.

Patented Nov. 12, 1912.

2 SHEETS—SHEET 2.



WITNESSES:

Wm N. Bruemmer

Mathilda Mettler

Emil Deister INVENTOR

BY A. G. Burns

ATTORNEY

E. DEISTER.

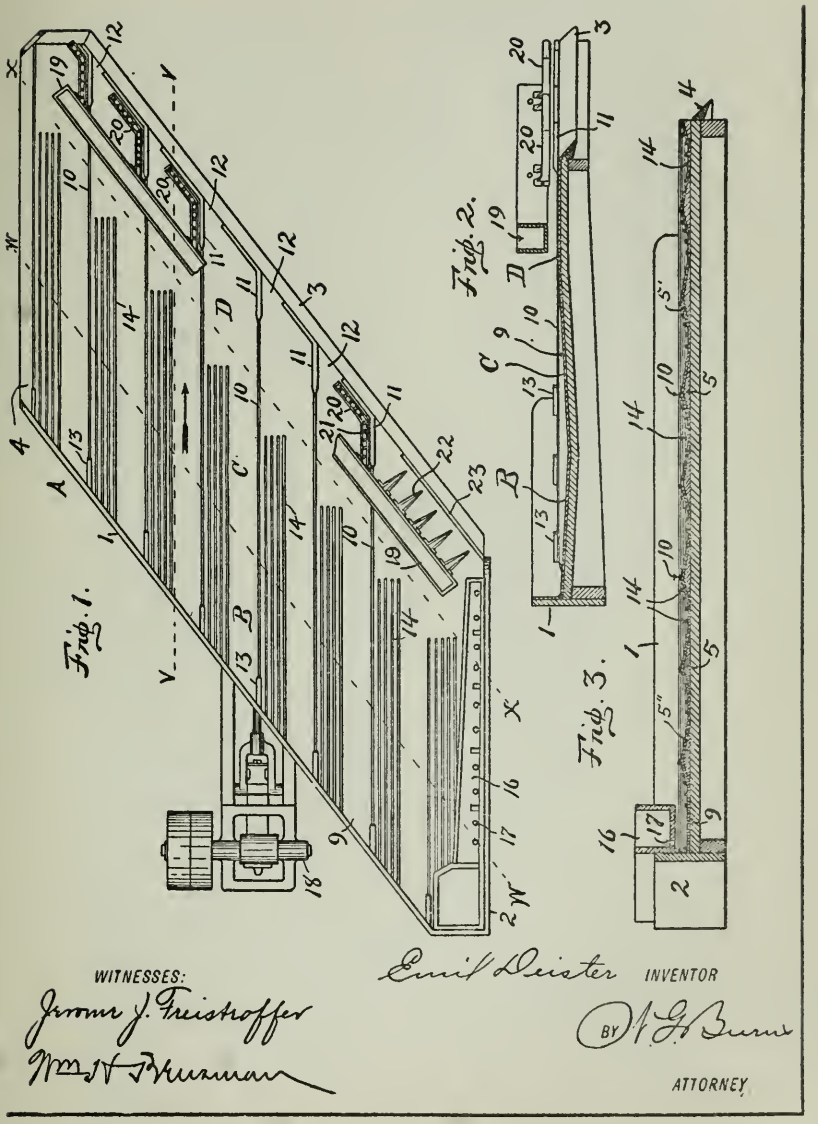
ORE CONCENTRATOR.

APPLICATION FILED AUG. 9, 1909.

1,019,884.

Patented Mar. 12, 1912.

2 SHEETS—SHEET 1.



No. 895,168. PATENTED AUG. 4, 1908.

E. DEISTER.

ORE CONCENTRATING TABLE.

APPLICATION FILED MAR. 3, 1906.

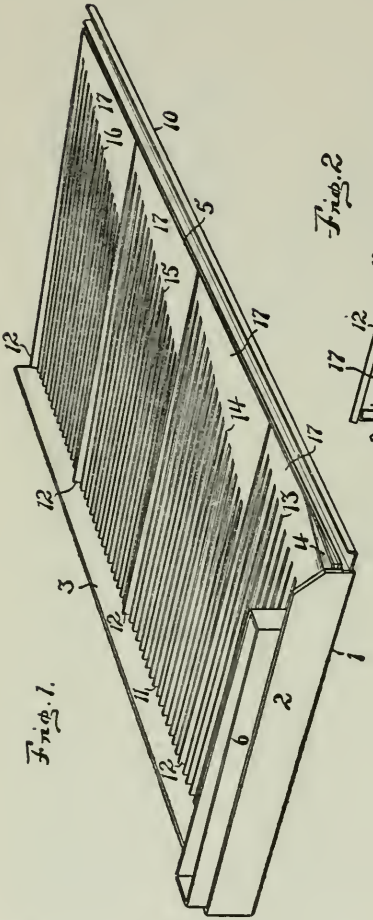


Fig. 1.

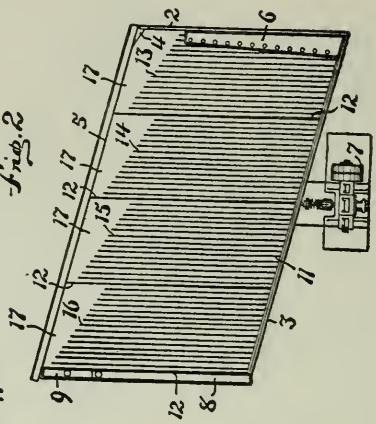


Fig. 2.

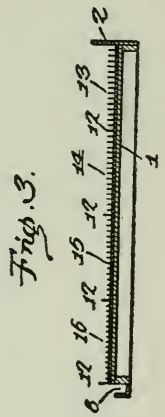


Fig. 3.

WITNESSES:

M. Mettler

William H. Bierman

Emil Deister INVENTOR

BY H. G. Burns

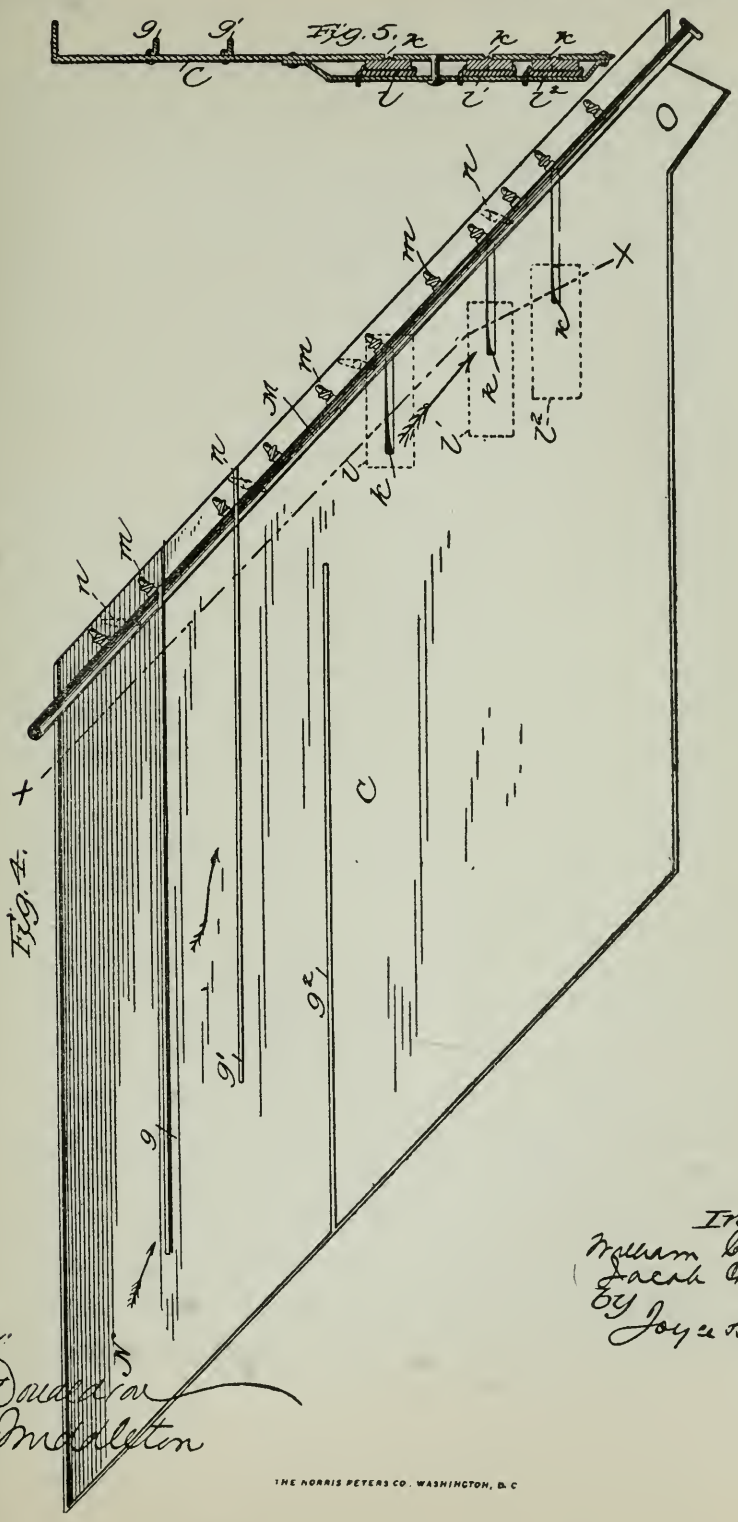
ATTORNEY

(No Model.) 4 Sheets—Sheet 4

J. CHERNEY & W. C. DAVIS.

ORE CONCENTRATOR.

No. 311,863. Patented Feb. 3, 1885.



Inventor
William C. Davis
Jacob Cherney
By Joyce & Dean
Attys.

Attest:
Walter Dowell
F. L. McMillon

THE NORRIS PETERS CO. WASHINGTON, D. C.

All that all this amounts to is that the patents are numerous and are for improvement inventions differing only in the configurations of the surfaces of the table decks. The field is therefore one in which the great chain of cases to which we have referred has logical and controlling application. *It follows that the monopoly created by an ore concentrator patent is extremely narrow.* It is a field in which *form* is everything, and in which, as Mr. Justice BRADLEY puts it, *each inventor is entitled to his own specific form.*

And that is just. Here is a multitude of patents, each entitled to the presumption of validity which attends its issue. The inventions described in them differ only in minute particulars. Each patentee is entitled to a monopoly of his own invention. We can give every one of them his own invention *provided we give no one of them any more.* Is not that the only way to do even justice to them all?

This gives us the measure of Mr. Wilfley's right. *It is to substantially his own form.* That does not include the Deister table.

Counsel on the other side will not be able to deny the existence of this chain of authorities and will hardly dare question their binding force, but they will try hard to find some ground of exception to them in favor of the Wilfley table. They urged in the court below that it embodied a new principle and was therefore entitled to a liberal construction. So it does embody a new principle, in a sense, and had to in order to be patentable. Section 4888, R. S., which defines the terms on which patents may be granted, expressly

requires that "in case of a machine, he (the applicant) shall explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions." We suppose the word principle as here used means mode of operation, or the operation of the machine in those particulars in which it differs from other machines. In practice it works out in this way: The applicant or his solicitor describes, first, the separate parts of the machine with the aid of drawings, and then describes how the parts are put together and how they co-operate to produce the result. This description covers all the actions and inter-actions which take place in the working of the machine, and so distinguishes it from other machines of the same general character. In applying for his patent Mr. Wilfley pursued this course. He first described the separate parts of the machine with the aid of seven different drawings of parts. He then explained the assembling of the parts and the operation of the completed concentrator, and so complied with the statute. Ore concentrators are all alike in this particular. Each one of them embodies some principle or principles by which it is distinguished from all the others.

As a result of its combination of riffles of progressively increasing length with a single unriffled space adjoining their terminals the Wilfley table has a washing up process of its own, on the strength of which it was claimed that the table possessed a novel function which should entitle the patent to a broad construction. But the function was the same as the

principle—the washing up process along the diagonal line of riffle tips. But that is only one way of washing the sand out of concentrates. It is not the only way, nor the best way. Far back in this brief at pages 20 and 21 we described how the last residue of fine sand is washed out of the concentrates on the Deister table by the water flowing down from the washboard. In connection with that description, on page 23, we promised to prove later that the greater part of the concentrates produced by the Deister table come from the first group of riffles—those above the first high riffle. We will do that now. Among the proofs put in evidence by the defendant is an exhibit on file in this court showing a measurement of the output of concentrates recovered by the Deister table taken separately from different parts of the riffle terminals. We reproduce that exhibit here.

Mill Test-Series No. 22.

Sampling of Concentrates from Deister Table.

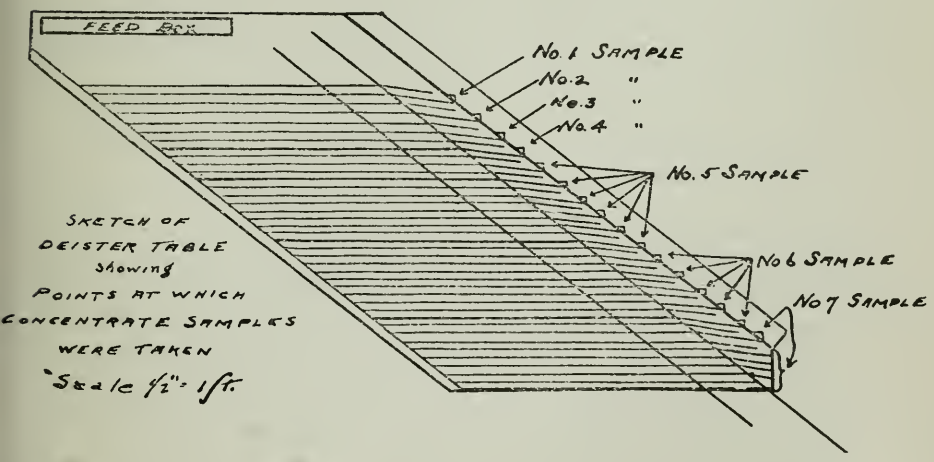
Mr. Norman Carmichael
Clifton, Arizona.

Dear Sir:-

The following figures on concentrates from one Deister Table were obtained at your request, in the presence of Mr. Deister and Mr. W.A. Moore. All the concentrates discharged for a period of 19 1/2 minutes, were caught, dried, weighed and sampled. The accompanying sketch shows the points at which the 7 separate samples were taken off the table. During the run it was noted that fine sand was being washed out of the concentrates over all the small inclined end riffles; the upper ones were conveying and cleaning concentrates for their entire length and the lower ones for only a portion of their length. Feed to table was coarse material dipped by paddle wheels from the slime overflow of Hancock jigs.

Results of Run.

Sample Number	Net dry Weight	% Copper	Lbs. Copper	% of total Copper	% Insol.
1	7# - 3 ozs.	18.24	1.3111	19.0	16.60
2	10 2	21.36	2.1627	31.4	8.80
3	8 13	23.14	1.5765	22.8	7.20
4	3 13	10.00	.6863	9.9	23.05
5	2 13 1/2	21.52	.6120	8.9	13.95
6	1 2	16.98	.1910	2.8	37.10
7	3 6 1/2	10.48	.3569	5.2	58.40
Totals	35 3	19.53	6.8965	100.0	



A careful study of this test will disclose some interesting facts. In the column of net dry weight of concentrates it appears that samples Nos. 1, 2, 3 and 4 weighed 28 pounds 7 ounces, while the total of all the samples was 35 pounds 3 ounces. Four-fifths of the concentrates came from the first division of the table, above the first high riffle. That means that four-fifths of the output of the table was safe in the concentrates box when the pulp had crossed less than half the length of the table. In pounds of assayed copper the same riffles yielded 5.73 pounds against a total of 6.89 pounds. The explanation is that at its first entrance upon the table the pulp contains its largest percentage of mineral and that in the form of its largest, heaviest particles. Were we not right in claiming, as we did, that the Deister table represents a great advance in the art over the Wilfley?

We submit that the Deister way of final washing up is not only different from the Wilfley way, but is a better way. The sum of it is that the Wilfley table is just what an inspection of Fig. 3 of the patent shows it to be—a machine having strong points of excellence, but with narrow limitations. Its plane, solid surface, its group of riffles of progressively increasing length, and its unriffled space adjoining their terminals form a combination of elements which are manifest on the face of the table. The attempts to evade the limitations of the claims of the patent upon the ground of some principle or function residing in the table had no foundation except in the imaginations of the experts. But their baseless theories so impressed the judge

of the District Court that he took it for granted that there must be some foundation for them, and without having any idea of what that was, he knowingly disregarded the plain language of the claims to meet, as he thought, some great equity in favor of the plaintiff.

The great chain of cases which we have cited cover a period in the history of the country cotemporaneous with the period of the issue of almost the entire body of patents in this country—1857 to 1911. In 1857 the total number of patents in existence was, in round numbers, 20,000; in 1911, 1,000,000. Those cases apply with more directness and force to ore concentrators than to the subjects of the adjudications themselves; more than to typewriters; washboards; coffee-mills; tin can machines; friction clutches or coal scuttles. *They embody the law. They apply to every ore concentrator patent in existence. They limit its monopoly to the invention described in it or mere evasions thereof.* The judgment of the District Court was a crime (an innocent one) against the law.

THE WESTINGHOUSE CASE

A situation sometimes arises in an advancing art in which the claims of an earlier patent, literally construed, will include, or may be claimed to include, the mechanism of a later patent which ought not in justice to be subject to its monoply. That situation is presented here. We do not admit that the Deister table is covered by the letter of the claims of the Wilfley patent, and we believe we have shown good reas-

ons why it is not. But counsel for the appellee will argue that it is, and we ought not to leave our client exposed to the least danger of that injustice, if we can avoid it. There is a line of cases which apply to just such a situation, and we feel it to be our duty to call the attention of the court to them.

The leading case in this line is *Westinghouse* v. *Boyden Power Brake Co.,* 170 U. S., 537.

This was a suit for infringement of claims 1, 2 and 4 of patent 360,070 to George Westinghouse, March 29, 1887, for improvement in air brakes. It was heard originally by the Circuit Court for the District of Maryland, which found for the defendant. 66 Fed., 997. Appeal was taken to the Circuit Court of Appeals for the Fourth Circuit, where the judgment of the District Court was affirmed as to claims 1 and 4, and reversed as to claim 2. 70 Fed., 816. From this judgment both parties applied for a writ of *certiorari* to the Supreme Court, which was granted.

The case is a great one. It deals with many questions. The inventions involved related to an art second to none in its importance to mankind—the control of railway trains. It was conceded that Mr. Westinghouse was the pioneer in air brakes. As such the court, on page 562, rank him with Howe of the sewing machine, Morse of the electric telegraph, and Bell of the telephone. But his pioneer patent had expired. He had taken out numerous patents for improvements, as also had a competitor, Geo. A. Boyden, who had made what the court regarded as a highly meritorious improvement. Comparing the

Westinghouse and Boyden improvements, the court said this on page 572-3 of the report:

> "The underlying distinction between the two devices is that in one, a separate valve and separate by-passage are provided for the train-pipe air, while in the other, the patentee has taken the old triple (or quadruple) valve, and by a slight change in the functions of two of its valves and the incorporation of a new element, (partition 9,) has made a more perfect brake than the one described in the Westinghouse patent. If the credit be due to Mr. Westinghouse for having invented the function, Mr. Boyden has certainly exhibited great ingenuity in the discovery of a new and more perfect method of performing such function. If his patent be compared with the later Westinghouse patent No. 376,837, which appears to have been the first completely successful one, the difference between the two, both in form and principle, becomes still more apparent, and the greater simplicity of the Boyden patent certainly entitles it to a favorable consideration. * * * * Under such circumstances, the law entitles him to the rights of an independent inventor."

The principle which we wish to apply here, and for the sake of which we cite the case, is stated thus on page 568:

> "But even if it be conceded that the Boyden device corresponds with the letter of the Westinghouse claims, that does not settle conclusively the question of infringement. We have repeatedly held that a charge of infringement is sometimes made out, though the letter of the claims be avoided. *Machine Co.* v. *Murphy,* 97 U. S., 120; *Ives* v. *Hamilton,* 92 U. S., 426, 431; *Morey* v. *Lockwood,* 8 Wall; 230; *Elizabeth* v. *Pavement Company,*

> 97 U. S., 126, 137; *Sessions* v. *Romadka,* 145 U. S., 29; *Hoyt* v. *Horne,* 145 U. S., 302. The converse is equally true. The patentee may bring the defendant within the letter of his claims, but if the latter has *so far changed the principle of the device* that the claims of the patent, literally construed, have ceased to represent his *actual invention,* he is as little subject to be adjudged an infringer as one who has violated the letter of a statute has to be convicted, when he has done nothing in conflict with its spirit and intent."

This decision has been followed by others to the same effect since, to some of which we beg leave to refer.

Norton v. *Wheaton,* 97 Fed., 636, was a suit on a patent for improvements in can-ending machines. The court said, on page 641:

> "In *Westinghouse* v. *Brake Co.,* 170 U. S. 537,568, the supreme court had before it the question of infringement involved in the mechanism for opening and closing certain valves in automatic air brakes. It was contended on the part of the complainant in that case that he was a pioneer inventor, and that the alleged infringing device corresponded to the very letter of the claims of the complainant's patent; but it was held that even this fact was not sufficient to establish infringement. The court said:
>
> 'The patentee may bring the defendant within the letter of his claims, but, if the latter has so far changed the principles of the device that the claims of the patent, literally construed, have ceased to represent his actual invention, he is as little subject to be adjudged an infringer as one who has violated

> the letter of a statute has to be convicted when he has done nothing in conflict with its spirit and intent.'"

Standard Computing Scale Co. v. *Computing Scale Co.,* 126 Fed., 639, (C. C. A., Sixth Circuit) was a suit for infringement of a number of patents for improvements in "weighing and price scales." The following is from the opinion, page 649:

> "Unless we attribute to the Culmer patent a scope so wide as to include all means of affecting flexibility between the beams, the applicant does not infringe, for it would be difficult to conceive things more unlike. It may be true that the appellant's structure would meet in a general way the calls of the first claim of the Culmer patent; but, if so, it is a capital illustration of the truth of what was said by Mr. Justice BROWN in delivering the opinion of the Supreme Court in *Westinghouse* v. *Boyden Power Brake Co.,* 170 U. S., at page 568, when he said:

Then follows the extract from the Westinghouse case just quoted. The court found for the defendant.

Severy Process Co. v. *Harper & Bros.,* 113 Fed., 581, 584. Patent for improvement in platens for printing presses. Cites *Westinghouse* v. *Boyden Power Brake Co.,* and states the principle in these words, on page 584:

> "Claims should not be so broadened by construction as to include devices which, though accomplishing the same function, do so by new combinations operating upon principles so different as to entitle their originator to be considered as an independent inventor."

Gen. Elec. Co. v. *Allis-Chalmers Co.,* 171 Fed., 666, was for infringement of a patent for "attachment for notched quadrants," which are devices used in the operation of electric motors. It was held that the patent was not infringed. The court refers to the Westinghouse case in these words, on page 669:

> "The complainant's invention was not broadly new; it did, however, make some advance upon the art, and is entitled to a reasonable but restricted application of the doctrine of equivalents. It will be observed that the claim in issue is very broad, broad enough indeed to embrace any and all means of supporting the latch, no matter whether the means were new or old, or within, or without, the range of equivalents. The fact, however, that the defendant's device may be within the language of the claim does not of itself prove that it is an infringement. Infringement is not a mere matter of words. In *Westinghouse* v. *Boyden,* 170 U. S., 537, at page 568, Mr. Justice BROWN in delivering the opinion of the court, said,"

Quoting the same paragraph above.

In the same case on appeal in *Gen. Elec. Co.* v. *Allis-Chalmers Co.,* 178 Fed., 273, the Court of Appeals affirmed the judgment below with this remark, at the close of the opinion on page 276:

> "The mere fact that the defendant's device may be within the letter of the claim sued on is not conclusive proof of infringement. This is shown in the opinion of Judge Cross in the court below (171 Fed., 666). We concur in the conclusion expressed by him in that opinion."

American Stoker Co. v. *Underfed Stoker Co. of America,* 182 Fed., 642. The suit was on a patent to James Garden for mechanical furnace stoker. After a discussion of the prior art and the construction of the devices employed by the parties respectively, the court said, on page 653:

> "We have then an entirely different furnace from the one described by Garden. It is true dead-plates are used, and that the result of their use is that the furnace becomes sealed and the gas does not flow down or the air escape upwards from the air box; but the new function which the defendant seeks to accomplish is by the use of the entire space underneath as a reservoir. I cannot avoid the conclusion that this was not an infringement of complainant's patent.
>
> I am of the opinion that the case of *Westinghouse* v. *Boyden Power Brake Co.,* 170 U. S., 537, 568, is authority for this conclusion. The court there said:
>
> 'The patentee may bring the defendant within the letter of his claims, but if the latter has so far changed the principle of the device that the claims of the patent, literally construed, have ceased to represent his actual invention, he is as little subject to be adjudged an infringer as one who has violated the letter of a statute has to be convicted, when he has done nothing in conflict with its spirit and intent.'"

The finding was for the defendant.

Here is another chain of cases beginning with *Westinghouse* v. *Boyden Power Brake Co.,* 170 U. S., 537, decided in 1898, and running down to 182 Fed.,

decided in 1910, in every one of which cases the Westinghouse case is followed, and these words quoted or expressly referred to, from page 568 of the report.

These decisions apply in this case with peculiar force. The patent in suit is an old one. It was an old one when this suit was begun. It was issued Sept. 28, 1897. The bill was filed Feb. 24, 1910 (Rec. p. 33). The patent was then over twelve years old. In the meantime the art had been developing. New ore concentrators had come into the field. The Deister was one of them. On pages 16 to 24 of this brief, and particularly on pages 22 and 23, we pointed out minutely the features of construction in which it represented an advance over what had preceded it. That it should be held to be covered by the claims of the old patent would be inherently unjust even though it might come within the letter of those claims. In the Westinghouse case the court found that the Boyden brake was to be regarded as a new invention and Boyden entitled to the rights of an inventor. Those were the words. So is the Deister table entitled to be regarded as a new invention. Even if it could be brought within the letter of the claims of the Wilfley patent, it is not within the spirit and intent of them, as the court again say.

It was not necessary to go beyond the Westinghouse case to make our argument complete. A decisision of the Supreme Court of the United States so recent and so precisely in point is enough to settle the law for this case. But to put the question beyond

cavil we have added the foregoing subsequent cases in which it has been recognized and followed; all which we submit with the deference due from counsel.

THE WILFLEY FILE WRAPPER

The file wrapper of the Wilfley patent is printed in the record on pages 265 to 305. It discloses some facts which are of importance in this argument. The specification as filed is on pages 266 to 275. It described the table exactly as it appears now in Fig. 3. It contained 8 claims, all of which were rejected by the Examiner on numerous references. They were then all erased by the solicitor and 15 others substituted. Of these numbers 1, 2 and 3 were in these words: (Page 281.)

> "1. A transversely inclined concentrating table having a movement whose tendency is to carry the material longitudinally forward toward the tail or foot of the table, said table being provided with a number of riffles extending longitudinally a portion of the distance from its head toward its foot, the table having a smooth, plain, or unriffled portion extending from the extremities of the riffles toward the tail of the table, whereby the material as it leaves the riffles is subjected to the action of the water on the smooth portion of the table and the final separation of the mineral from the gangue effected."
>
> "2. A transversely inclined concentrating table having a series of longitudinal riffles extending a portion of the distance from the head toward the tail of the table, the table being provided with a smooth, plain, or un-

> riffled portion located at the extremities of the riffles."
>
> "3. A concentrating table having a number of longitudinal riffles extending a portion of the distance from its head toward the tail thereof, the table being provided with an unriffled portion extending from the riffle extremities toward the tail or foot of the table."

These were rejected by the Examiner on Blatchly & Kustel, 258.879, with the remark that claims 4, 9, 10, 12, 13, 14 and 15 might possibly be allowed. (Rec. p. 288-9) . The applicant then erased claims 2, 3, 5, 6, 7, 8, 9 and 11 and amended claim 1 by inserting the words "of varying length" and the words "said riffles varying in length for the purpose specified," and changed the number of claim 4 to 2; 10 to 3; 12 to 4; 13 to 5; 14 to 6; and 15 to 7; and the claims as thus renumbered were allowed. In an argument responding to the rejection of the original 8 claims the applicant described the washing up process which takes place at the terminals of the riffles adjoining the "smooth portion A" in the same language in which it is described on page 2, lines 7 to 56 of the patent as issued. (Rec. p. 278, 7 bottom lines, to p. 280, first par.) In his argument in support of claim 1 as finally amended the solicitor said this:

> "The claim is also believed clearly allowable, in view of the Blatchly reference, since his riffles or corrugations formed in the rubber applied to the table, are all of the same length. Hence, his table will not perform the function of applicant's table.

Here is the "function" of which we have heard so much—the washing up process of the Wilfley table.

To appreciate the full meaning of this disclaimer will require a description of the Blatchly & Kustel table. A zincograph of it is among the foregoing reproductions and we insert it here again for reference.

Blatchly & Kustel, 258, 879, June 6, 1882.

This patent proposes an elaborate scheme of ore concentration, having no less than five pairs of tables carried on one supporting frame. The cut here inserted shows the whole mechanism. But the patentee says that one pair may be used singly, and we will therefore refer in our discussion to the upper pair only, a top view of which is shown in Fig. 2 of the drawing. The upper half of this figure represents the wooden floor prepared for the rubber covering shown in the lower half of the same figure. It is formed from two thicknesses of narrow strips of wood laid at right angles to each other and fastened together at their intersections by screws or nails. The drawing shows the construction clearly. The object is to make a floor for the table that will not warp. The complete top view of the working table is therefore shown in the lower half of Fig. 2.

It is covered with a sheet of India rubber J, part of which is corrugated, like that used for stair carpet, and the remainder smooth. The corrugated part is plainly distinguishable in the drawing from the smooth part, which shows in white. The corrugations form riffles. The pulp is delivered upon this riffled surface through a strainer, M. The table slopes from the left hand end, or the head, to the right, as shown in

(No Model.) 2 Sheets—Sheet 1.

A. BLATCHLY & G. KUSTEL.

ORE CONCENTRATOR.

No. 258,879. Patented June 6, 1882.

Fig. 1

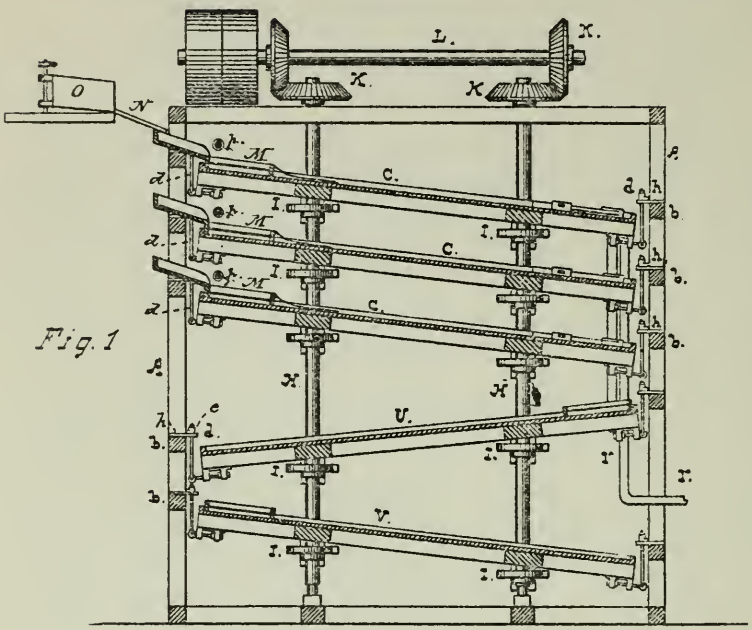
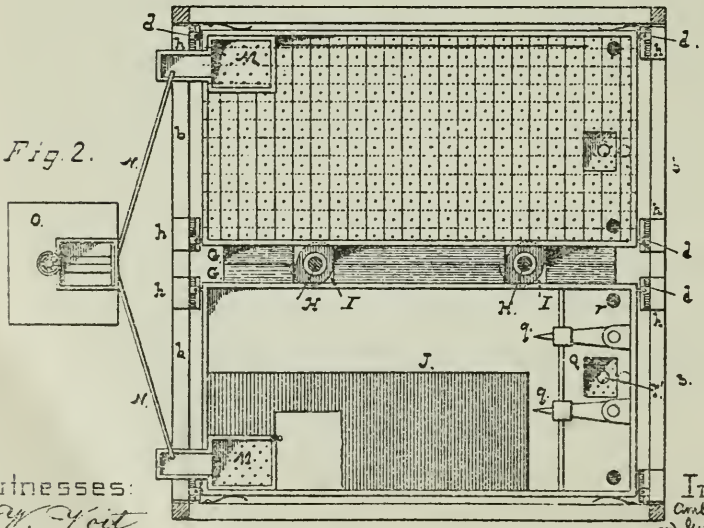


Fig. 2.



Witnesses:
W. Voit
E. G. Clarke

Inventors
Andrew Blatchly
and Gust. Kustel
Pyther Attys., Dana & Poland

the side view of the upper table at C in Fig. 1. Now we see the operation.

The pulp flows down the table across the riffles to its foot. As it goes the particles of metal lodge in the troughs between the riffles—some in each trough, as the pulp passes over; so that by the time it reaches the foot of the riffled surface there is little mineral left in the pulp. While this process is going on a reciprocating movement is taking place which impels the material in the riffle troughs forward toward the smooth space adjacent to their terminals. The mechanism by which this movement is produced may be described as follows Two vertical shafts shown at H H in Fig. 1 extend from top to bottom of the apparatus. These shafts carry cams I I—one pair for each pair of tables. These shafts and the cams attached to them are shown in cross section at H H in Fig. 2. The cams act on bumper bars G G, first to force the two tables apart a little way, and then let them come together, which they do by their own weight. Each table hangs suspended on four links at its corners, so that it has a slight swing to and fro. These links are shown most plainly at *d d* in Fig. 1, but their upper ends appear under the same letters in Fig. 2. As the cams revolve the two tables are first separated a short distance and then swing together with a gentle bump. This furnishes a true reciprocating movement by which the material in the riffle troughs is impelled toward their terminals, where it is delivered upon the smooth space adjoining those terminals. Water is supplied to the table from a perforated pipe p, shown in cross-section three times in Fig. 1.

The jets of clear water from this pipe wash the pulp as it flows across the riffles, carrying the lighter constituents down to the foot of the table, and flooding the smooth space in front of the riffle terminals. At the lower part of the smooth space are two adjustable dividers *q q*, the outer ends of which can be adjusted toward either side of the table so as to divide the material moving down into three parts. In accordance with the principle stated in our description of the Wilfley patent the reciprocating movement operates to drive the solid particles of metal across the table more rapidly than the lighter grains of sand. This results in an assorting process on the smooth space. The pure concentrates are driven farthest toward the inner side of the table, where they pass into the concentrates box through the hole *r;* the middlings pass between the two dividers, and are taken off through the strainer Q. The coarser constituents of the middlings are worthless and are taken out by the strainer and go to waste. The finer parts pass down through the pipe *r'* to the table below to be retreated. The worthless gangue passes off across the space outside the outer divider *q*. These dividers being adjustable in position can be moved inwardly or outwardly so as to cause the concentrates, middlings and gangue to leave the table in proper proportions. We will conclude this description by quoting the patentee's general statement of the principles upon which the apparatus operates—page 2 of the specification, line 30 to 46.

> "The pulp, when thus sifted upon the upper outside corner of the concentrating surface,

> will begin to flow down toward its lower end; but the constant motion and concussion or jar will cause the heavier particles to separate and settle to the bottoms of the corrugations and be carried by the concussion directly across the table to the smooth surface, over which they will move in a diagonal direction to the lower corner of the table. The angle which the particles will take on moving across the smooth inclined surface will be greater or less according to their specific gravity, because the heavier the particles the more sensitive will they be to the concussion or jar, while the lighter particles, being less sensitive, will move down the incline in a more nearly direct line."

We can now see at a glance the patentee's scheme. It was to treat the material first on the upper pair of tables, and save the clean concentrates extracted there; then retreat the middlings on the next pair below, and so on until the last vestige of value had been extracted. For obvious reasons the machine never went into general use. It was too complicated. But taking the top pair of tables by themselves, with such enlargement of area and modification of riffles as practical use would soon suggest it would be an efficient and successful ore concentrator. It embodies all the elements and principles of some of the best tables in use today.

This is the Wilfley table in every respect except the feature of progressively increasing length in its riffles, and it was patented *14 years before the Wilfley patent was applied for.* The pulp flows down across its riffles in the same way; the metallic particles are caught in the riffle troughs in the same way, and

driven along those troughs by a reciprocating movement and out upon a smooth space in the same way; and the concentrates are washed up by flowing water on the smooth space in the same way. The only difference is that the riffles are of uniform length instead of progressively increasing length, as on the Wilfley. There was nothing left for Mr. Wilfley except exactly what he got; and he took it without a word of complaint. In this narrow field of invention, with its multitude of patents, does not the law, as we have laid it before the court, and intrinsic justice as well, require the court to hold the appellee to its patent and its claims and reverse the judgment below?

Equal in importance to the reference to the Blatchly and Kustel patent in the Wilfley file wrapper is the fact that in the original application for the Wilfley patent the first claim contained no reference to any smooth or unriffled space on the table. It was in these words:

> "1. The transversely inclined concentrating table having longitudinal riffles varying in length, the riffle nearest the upper edge of the table being shortest and that nearest the lower edge of the table longest, while the inter-intermediate riffles increase in length from the upper part of the table downward." (Rec. page 273, lines 2 to 7.)

This claim was rejected by the Examiner on numerous references, (Rec. p. 276, last line, to p. 277, first three lines) and was withdrawn by the solicitor with all his other original claims (Rec. p. 280, last two lines) and does not appear again. Mr. Wilfley therefore asked for a claim covering his longitudinal riffles

varying in length, but omitting the smooth or unriffled space adjoining their terminals. Having acquiesced in the rejection of that claim he cannot now be heard to assert that his claims as allowed can be construed to include any form covered by the rejected claim.

THE LAMPERT PATENT

One more patent remains to complete this argument. It is number 533,336, issued Jan. 29, 1895, to Jacob Lampert.

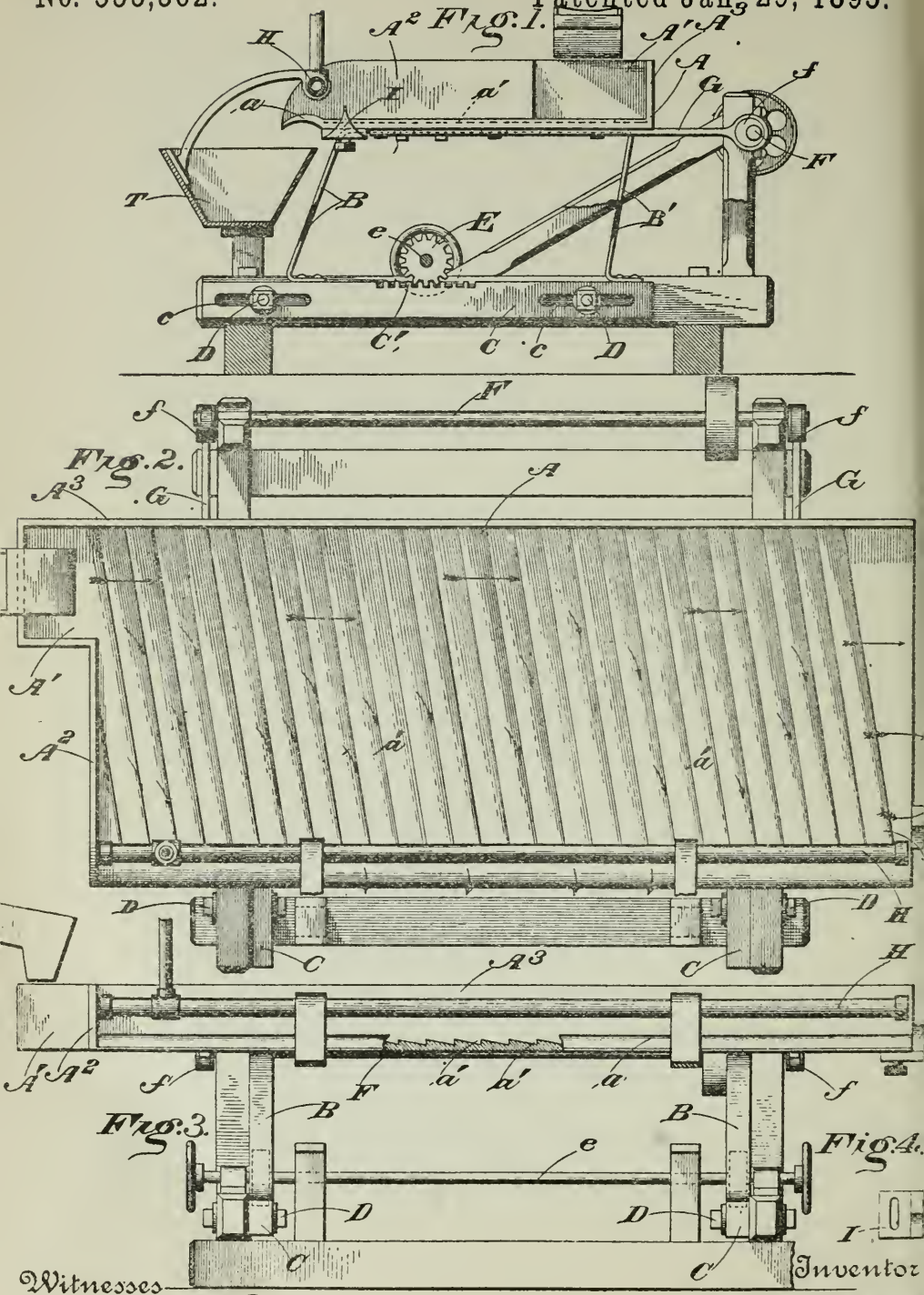
This is a short patent, the drawings occupying one page, and the specifications and claims less than two. The cut here inserted is a reproduction of the drawings. Fig. 2 shows the deck. A reciprocating movement is communicated to the table from a shaft F actuating two cams *f f* connected with the table by straps G G. Because of the slightly diagonal position of the riffles on the table the reciprocating movement is not exactly in line with them. But it is nearly enough so to produce its characteristic effect upon material on the table. At A' is the pulp box, and from that end the table slopes toward the foot. There is mechanism (shown in Fig. 1) by which the slope can be varied. As the pulp flows down the table the main mass of it takes the course across the riffles indicated by the large, feathered arrows. Under the influence of the reciprocating movement the concentrates gradually turn toward the riffle tips, as indicated by the little, tailless arrows, and go into the concentrates box at the side of the table.

(No Model.)

J. LAMPERT.

CONCENTRATOR.

No. 533,362. Patented Jan. 29, 1895.



Witnesses
M. C. Fowler.
James R. Mansfield

Inventor
Jacob Lampert
by Alexander & Dowell.
Attorneys

In a side view in Fig. 1 is shown the concentrates box T and the devices employed for final washing up of the concentrates. The specification says—page 1, line 65, "Along the delivery or front side of the table is a bead, or flange *a*, which rises slightly above the top of the table, and over which the concentrates escape into a trough T, or other receiver." At H in Fig. 2 is shown a water pipe extending along the lower edge of the table. The same water pipe appears in cross section at H in Fig. 1. It is perforated, and sprinkles the surface of the bead with a continual flow.

The word "bead" is an unusual name to apply in such a connection, and as shown in the drawing, it would seem to be a rather sharp obstruction for the concentrates to climb over. But there are no limitations in the patent as to its height or width, so that the constructor can make it as flat and broad as he chooses, and there is no reason, apparently, why the table may not work well. Besides, the patentee proposes, as he says, to run the vibrating mechanism at the rate of about six hundred vibrations per minute. The usual rate is about half that.

The signifigance of this patent lies in its resemblance to the Deister table here in controversy. While the outside lines of the table are rectangular, the space occupied by the riffles is rhomboidal, like the Deister. As in the Deister, the pulp flows down the longer dimension of the table, gradually losing its metallic values until the gangue goes off at the foot. Meanwhile the particles of metal turn aside in obedience to the impulses of the reciprocating movement to follow the

riffle troughs to the concentrates discharge, as in the Deister. It will not be pretended that the owner of the Wilfley patent could enforce it against a table like this. The Lampert patent is over two years and a half older than the Wilfley. Such a suit would be ridiculous. While the Deister table came into the art many years after the issue of the Wilfley patent, it harks back to the prior art in its construction and operation. That fact lends emphasis to the other arguments which establish on many grounds the non-infringement of the Wilfley patent by Deister No. 2.

While the Blatchly & Kustel patent stands as an absolute limitation on the Wilfley patent in respect to the scope of its claims, it and the Lampert patent are also pertinent to the point that Wilfley was only an improver and not a pioneer in the art; and as a mere improver subject to the limitations in the scope of his monopoly which are laid down in *McCormick* v. *Talcott* and *Railway* v. *Sayles* and the great chain of cases following them. They are of themselves sufficient to negative any claim by Wilfley to the standing of a pioneer. But there are many others. There are 21 named on pages 47 and 50 of the record. They were all put in evidence by the defendant at the hearing, and copies of all of them were furnished to the clerk for the record here. By some mishap only a part of them appear in the printed volume. But the omission is not important, as there are enough of them in the record for the present purpose. The following among them may be named as ore concentrators prior to Wilfley.

Waitt.....513,849, Jan. 30, 1894, Rec. p. 310.
Gates.....415,999, Nov. 26, 1889, Rec. p. 320.
Wilder.....149,622, Apr. 14, 1874, Rec. p. 327.
Chatterson.....528,503, Oct. 30, 1894, Rec. p. 330.
Look.....526,242, Sept. 18, 1894, Rec. p. 336.
Krause.....349,504, Sept. 21, 1886, Rec. p. 343.
Pike.....566,534, Aug. 25, 1897, Rec. p. 349.
Lampert.....533,362, Jan. 29, 1895, Rec. p. 353.
Blatchly & Kustel 258,879, June 6, 1882, Rec. p. 357.

We have therefore, nine ore concentrator patents printed in the record, running from 1882 to 1895 in date, and all prior to Wilfley. These are enough to show that Mr. Wilfley stands far down in the line of improvers. He cannot possibly escape the force of the authorities which limit his monopoly to substantially his own form.

EXTENSIVE USE

The experts for the plaintiff in the District Court had much to say of the extensive use of the Wilfley table. In fact, apart from the claim that it embodied a new principle or function, which claim we have discussed, they had no argument to offer in its behalf except that a great many had been sold —many thousands, it was said. They offered no evidence to show that it was a better concentrator on its merits than any other—that it could do more work, or better work, or cheaper work than any other. If the validity of the patent had been in dispute, this evidence of extensive sales would have been competent. The fact that a patented article is received with great favor is some

evidence that it took invention to produce it. If common skill could have supplied it, mechanics and engineers would have been glad to furnish it. Extensive sale is therefore some evidence of *invention* when that question is in doubt. But it is weak evidence, even then. There are so many other things that influence sales. Energetic exploitation by a strong manufacturer like the Mine and Smelter Supply Company, with large profits to make, is the most common cause of great sales. So that it is only when the question of validity is in issue and is doubtful that it is admissible. The cases on this subject are numerous.

In *McClain* v. *Ortmayer,* 141 U. S., 419, the suit was on two patents for improvements in horse collars. On page 427 of the report the court states the position of counsel for the patentee as follows:

> "Counsel for the plaintiff in the case under consideration has argued most earnestly that the only practical test of invention is the effect of the device upon the useful arts—in other words, that utility is the sole test of invention, and, inferentially at least, that the utility of a device is conclusively proven by the extent to which it has gone into general use. He cited in this connection certain English cases which go far to support his contention."

After pointing out the difference between the English patent law and ours in this respect, the court added, on page 428:

> "It is evident that these principles have no application to the patent system of the United

> States, whose beneficence is strictly limited to the invention of what is new and useful, and that the English cases construing even their more recent acts, must be received with some qualification. That the extent to which a patented device has gone into use is an unsafe criterion even of its actual utility, is evident from the fact that the general introduction of manufactured articles is as often effected by extensive and judicious advertising, activity in putting the goods upon the market and large commissions to dealers, as by the intrinsic merit of the articles themselves."

To like import is *Duer* v. *Corbin Cabinet Lock Co.*, 149 U. S., 216, where the suit was on a patent to Morris L. Orum for improvement in furniture locks. On the subject of the extensive sale of the invention the court remarked as follows, on pages 223-4:

> "It is true the Orum lock seems to have gained an immediate popularity, to have met with large and increasing sales, and to have had the usual effect of successful patents in stimulating the activity of business competitors to produce an equally useful and popular device. Were the question of patentability one of doubt this might suffice to turn the scale in favor of the patentee. But there are so many other considerations than that of novelty entering into a question of this kind that the popularity of the article becomes an unsafe criterion. For instance, a man may, by the aid of an alluring trade-mark, succeed in catching the eye of the people, and palming off upon them wares of no greater intrinsic value than those of his rivals; but such trade-mark may be, and usually is, wholly destitute of originality,

> often taken from some prior publication, and appropriated to the specific purpose of the owner. The same result may follow from the more attractive appearance or the more perfect finish of the article, from more extensive advertising, larger discounts in price, or greater energy in pushing sales."

See also *Union Biscuit Co.* v. *Peters,* 125 Fed., 601, (C. C. A., Eight Cir.) p. 608-9.

Fernald v. *Oneida Nat. Chuck Co.,* 167 Fed., 559, 564.

Beckwith v. *Malleable Iron Range Co.,* 174 Fed., 1001, 1008-9.

Walker on Patents, Fourth Ed., Sec. 40 and note.

These cases establish that it is only where the question of utility is in doubt that extensive use is a fact to be considered. That question can arise only when the validity of the patent is in issue, as it is not, here. The validity of the Wilfley patent is admitted. That carries with it an admission of novelty, invention and utility in the patent. The only issue is non-infringement. Upon that question extent of use has no bearing whatever.

THE DISTRICT COURT DECISIONS

The bill sets up an adjudication in the Circuit Court for the District of Colorado in a suit brought by Arthur R. Wilfley against the Denver Engineering Works and Ira C. Cammett and Frank E. Shepard for infringement of his patent, in which judgment was rendered for the complainant. This was before the

assignment of the patent to the Mine and Smelter Supply Co. The case is reported in 111 Fed., 760. This judgment, although set up in the bill, has none of the effect of an estoppel, or to put the defendant on its defense upon the merits of the case as it would have if the bill were for a preliminary injunction. It has no effect beyond the persuasive force of a precedent to be weighed and counted for what it is worth. And that is not much.

The main issue discussed was the one of validity. As to that the court was right in finding the patent valid. The description in the opinion on page 763 of the washing up process on the Wilfley table is accurate, and the sentence with which it concludes, "and it is the taking advantage of this diagonal arrangement by the adjustment of the riffles with reference thereto, that is new and valuable in the patent," is entirely true. But upon the question of infringement the court went astray, which is not strange. It was the first suit ever tried for infringement of an ore concentrator patent, so far as appears, or so far as we are aware. Manifestly the court was not familiar with the prior art, for it classed the Wilfley patent as a pioneer. If it had been that, there would be little fault to find with the decision. But treating the Wilfley patent as we have shown it must be treated—as an improvement patent merely, the finding of the court on the question of infringement cannot be supported. The court looked at the Wilfley table just as it would at any other sort of machine. It felt itself at liberty to extend its claims to any similarity of construction found on

any part of the surface of another table. Because the riffles of the Cammett and Shepard table at a place midway their length declined in elevation along a diagonal zone across the table they were taken as the equivalents of the Wilfley riffles, and because the riffles on that part of the table below the central portion were flattened out so as to leave only very narrow spaces between them, the court took that part of the table as the equivalent of the smooth space A on the Wilfley. But this view rests upon a misunderstanding of the operation of the table. The material which passes along those narrow channels between the flattened riffles is pulp in the process of concentration—partly concentrated. It is pushed along those channels by the reciprocating movement; the jarring produced by that movement promotes the gravitation of the metallic particles to the bottoms of the channels, which brings the sand to the top where it is exposed to the cross flow of the water and washed off at the tailings side. That is not at all what takes place on the smooth space A of the Wilfley table.

But all this is unimportant here. We have no quarrel with that part of the opinion which finds the Wilfley patent valid, for we admit that; and as to that part of it which finds infringement, it need not concern us, because the Deister table is a totally different structure from the Cammett and Shepard. It may be that the Cammett and Shepard table infringed the Wilfley patent and that the Deister table, which came into existence a number of years after that decision, and represents a large advance in the art, does not.

The only other reported case that we are aware of is *Mine and Smelter Supply Co.* v. *Braeckel Concentrator Co.* et al., 197 Fed., 897. In that case the defendant set up a big fight against the validity of the patent, the consideration of which occupies the greater part of the opinion, but which, as we have said, does not interest us here. It is a little uncertain from the description of the defendants' table contained in the report how the riffles on it were arranged, but from what appears in the opinion on page 906 it seems likely that the table was such a close imitation of the Wilfley table that it could be classed as a mere evasion. The decision is not one to carry weight. It contains no discussion of the prior art nor of the claims—not even a copy of them, and no reference to any authorities on the subject of infringement except one on page 907, which expressly applies to a pioneer invention. It throws no light whatever on the questions in issue here.

FINALLY

A few words of review will close this long brief. At the beginning we described the Wilfley and the Deister tables with a drawing of the concentrating surface of each; analyzed the patent and the claims in suit, and showed by the application of the words of the claims taken in their plain and ordinary sense to the Deister table that it does not infringe the Wilfley patent. From page 8 to page 34 of the brief are occupied with this argument. On pages 34 to 43 we cited a number of cases on the construction of claims which supported the argument we had made. We thus demonstrated in short order the error of the judgment of the District Court UNLESS for some reason or other the Wilfley patent is entitled to an exceptional standing before the law and treatment by the court. The District Court supposed that it was, and for that reason fell into error. We have pointed out on page 43 to page 67 *ante* how and where the court went astray.

The appellee must stand by that decision, and the main endeavor of counsel here will be to find some ground on which to base their contention that the Wilfley patent is entitled to extraordinary consideration by the court. It is impossible to claim that Wilfley was a pioneer in the art of ore concentration in the face of the prior ore concentrator patents enumerated on page 143 *ante*. Counsel may sneer at them as paper patents. But every one of them carries with it a presumption of validity, which holds

until it is overturned by proof. That has not been done as to any one of them or any other ore concentrator patent. There is no reported case holding any ore concentrator patent void. All the hundreds of patents for ore concentrators now outstanding must be taken for the purpose of this case as valid. The patents enumerated in that list are therefore effective to put the Wilfley patent far down in the procession of improvement inventions. We suppose that the plaintiff had a right to prove by evidence that the prior patents enumerated in the defendant's answer were unworkable devices, but it did not offer any such evidence. It is too late now to make the objection. While the general rule is that an improvement patent is to be held to a narrow construction, as the cases we have cited abundantly show, that rule is sometimes relaxed in favor of an improvement invention of extraordinary merit. It is impossible to frame a hard and fast definition of those cases, but the patents must disclose inventions of extraordinary value to the public. The most noted case of this kind is what is known as the Brake Beam case— *National Hollow Brake-Beam Co.* v. *Interchangeable Brake-Beam Co.,* 106 Fed., 693. In their brief in the District Court counsel for the complainant cited this case over and over many times. But it has no relevance here except as an illustration of the favor which may be extended to an improvement invention of extraordinary merit in a suitable case. The subject matter was of the highest importance—the control of railway trains; its value in that great field was almost immeasurable.

An ore concentrator is a mere chip by the wayside in comparison. And yet the principle which was applied there could undoubtedly be applied in the field of ore concentrators. We can imagine the existence of a concentrating table of extraordinary merit—a table distinguished above others in excellence so distinctly and undeniably that the patent covering it would be justly entitled to a wider range of equivalents than that ordinarily accorded to such patents. But those qualities must be shown by evidence. Where is it in this case? The experts lauded the patent to the skies, as we have shown on pages 68 to 75 *ante*. But no one testified that it would work with more economy of power; or treat more pulp in a day; or get more value out of the pulp treated on it; or lose less value in the tailings; or turn off purer concentrates; or anything of that kind. These are the elements of excellence in an ore concentrator, and there is no evidence that they are found in any extraordinary degree in the Wilfley concentrator. It is just a fairly good table with the advantage of simplicity of construction and convenience of operation. There are no facts on which to base a claim for special favor for the patent. The table has, in consequence of its combination of progressively lengthening riffles with a single unriffled space adjoining their terminals, a washing up process for which great merit was claimed by the experts, who paraded it as a principle or function so new and valuable that it entitled the patent to special consideration. But that was a mere incident of the structure of the table, for which alone the patent was or could

be granted—not for a principle or function. It was *one way* of washing up; not the only way, nor the best way.

It was these unfounded pretensions of the experts that led the judge of the District Court to knowingly disregard the plain language of the claims. He was aware that he was not giving effect to them, but he thought that some extraordinary excellence in the patent made it his duty to find as he did. He did not define that excellence further than to state the plaintiff's claim that "the Wilfley patent embodied a new principle in the art of wet concentration of ore and the machine patented was the first to perform a new and definite function in the practice of ore dressing so as to produce both increased efficiency and capacity." (Rec. p. 64, l. 15 to 20). On pages 47 to 67 *ante,* we have shown by extended, not to say wearisome references to the record, that this was not true in any particular. It follows that the Wilfley patent must take its place among the improvement patents and be judged by the same rules of law that apply to the others.

In the taking of the proofs in the District Court the plaintiff examined six witnesses in *prima facie*—all as experts except one. Their depositions in the condensed and abbreviated form required by the new equity rules occupy from page 141 to 204 in the record, making 63 pages. In the original record it occupied 297 pages. The defendant then put in the testimony of 14 witnesses, the condensed statement of which

occupies 13 pages of the record—(p. 237 to 250)—the original printed record occupied 143 pages.

The testimony of Browne, the expert, was taken at Washington. The testimony of Bensman and O'Connell and Reid was taken at Fort Wayne, Ind. The others were all taken at Morenci, Arizona, right at the doors of the mines in which the Deister tables here in controversy were at work. In the testimony of John Kiddie (Rec. p. 240-242) the Deister and its mode of operation were described with a drawing of it (Rec. p. 240), including a test of the material passing between the deflected portions of the riffles on it (Rec. p. 243-4), the relative sizes and weights of the Wilfley and Deister tables and a comparative test of output of the Wilfley and Deister tables. (Rec. p. 246-7).

This was the defendant's case. It showed that the Deister was a little table with a concentrating surface of 36.6 sq. ft. against 78 sq. ft. in the Wilfley, and a shipping weight of about 1500 lbs. against about 2800 lbs. for the Wilfley, *but capable of doing as much work and doing it better.* All these drawings, tests, dimensions and figures are before this court in the hands of the clerk as exhibits, and we have reproduced a number of them in this brief. Counsel for the complainant attended all the examinations and cross examined the witnesses at length and was offered opportunity to verify all the tests. In the innocence of our hearts we thought this was enough to acquit our client. The complainant did not undertake to disprove a single fact to which our witnesses had

testified. Those being admitted, there was nothing to rebut. Nothing remained but a question of law—were the facts offered by us a bar to the complainant's suit? But to our astonishment the complainant proceeded to offer 721 pages of so-called rebutting proofs, of which 609 pages are contained in the exhibit volume on file entitled "Book of Complainant's Paper Exhibits, Drawings and Photographs," which we hope the court will find time to examine. It will be found to contain at the close 145 pages of photographs which have about as much relevance to this case as a photograph of the transit of Venus.

We yield to no one in loyalty to the patent system of the United States. We believe the patent statutes have had more to do with the marvellous industrial development of our country than any other laws. We believe in the firm maintenance of the just rights of patentees. But greedy human nature, here as elsewhere, is never satisfied. It is not enough for the appellee to enjoy through all these years the enormous profits on thousands—many thousands of Wilfley tables which it has sold. It will be content only with the extermination of the little Deister.

2 Samuel, chap. 12, v. 1-4.

Respectfully submitted,

ROBERT S. TAYLOR,
ELWIN M. HULSE,

Solicitors and of counsel for the Appellants

(No Model.) 2 Sheets—Sheet 1.

A. R. WILFLEY.

ORE CONCENTRATOR.

No. 590,675 Patented Sept. 28, 1897.

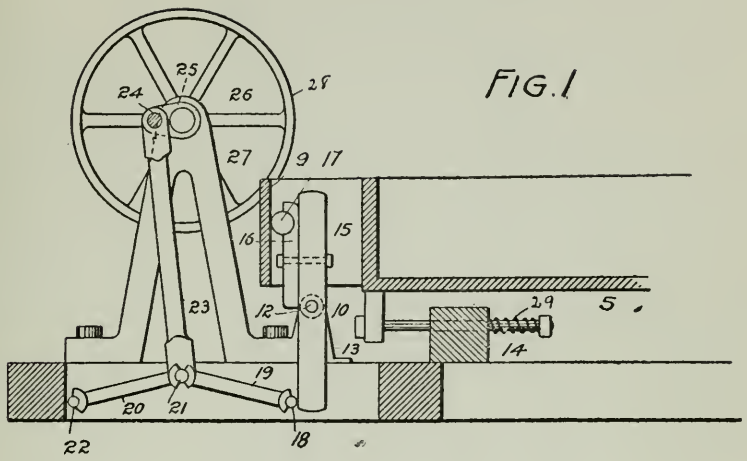


FIG. 1

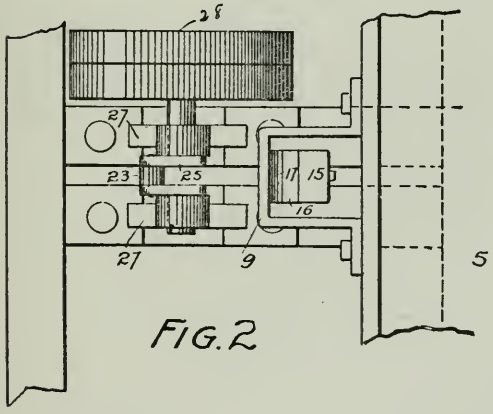


FIG. 2

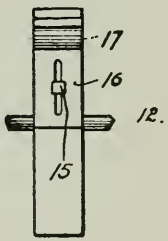


FIG. 6.

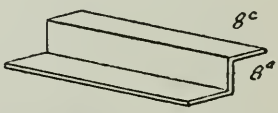


FIG. 7



FIG. 5

Witnesses
Edith Hemsworth.

Inventor
A. R. Wilfley

By his Attorney

(No Model.) 2 Sheets—Sheet 2.

A. R. WILFLEY.

ORE CONCENTRATOR.

No. 590,675 Patented Sept. 28, 1897

FIG. 3.

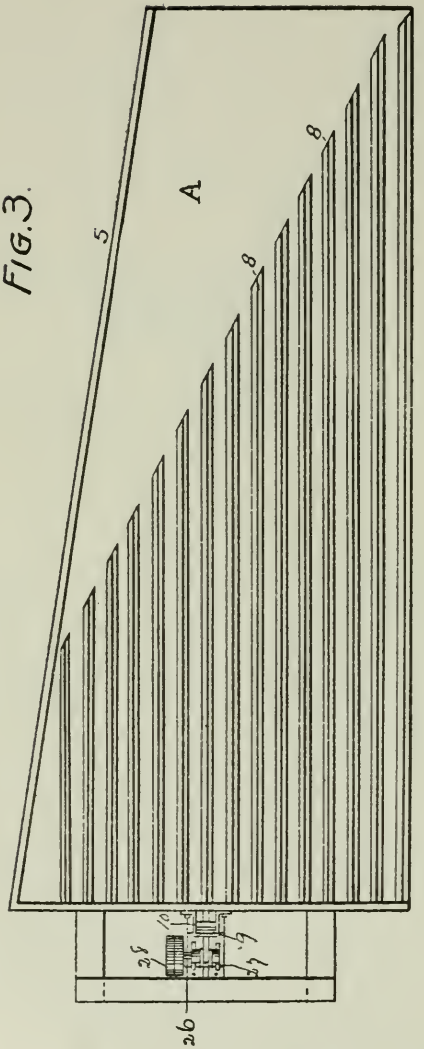
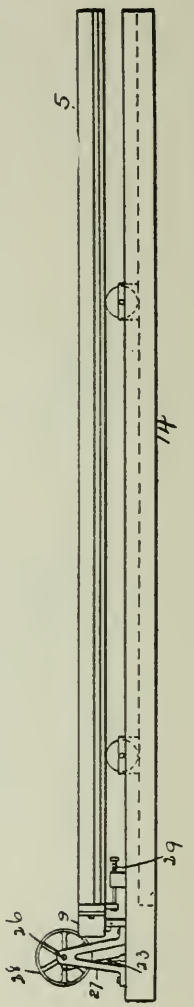


FIG. 4.



Witnesses
[illegible]
Edith Hinsworth

Inventor
A. R. Wilfley
By his Attorney
[illegible]

UNITED STATES PATENT OFFICE.

ARTHUR R. WILFLEY, OF DENVER, COLORADO

ORE-CONCENTRATOR

SPECIFICATION forming part of Letters Patent No. 590,675, dated September 28, 1897.

Application filed March 18, 1897. Serial No. 627,798. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR R. WILFLEY, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Ore-Concentrators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in ore-concentrators; and it consists of the features hereinafter described and claimed, all of which will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a side elevation of the apparatus, partly in section. Fig. 2 is a top or plan view of the same. Fig. 3 is a plan view of the table. Fig. 4 is a side elevation of the same. Fig. 5 is a cross-section of the table. Fig. 6 is a detail view of a lever forming a part of the operating mechanism. Fig. 7 is a perspective view of one of the riffles detached.

Similar reference-characters indicate corresponding parts in the views.

Let the numeral 5 designate the table, provided with longitudinal riffles 8, attached to its upper surface. These riffles are of unequal length and angular in cross-section. The vertical or upwardly-projecting part of the riffle is designated by the reference-character 8*, and the upper part, which lies parallel with the bed of the table, is designated by the reference-character 8'. The table tapers from the head toward the foot, where it is narrowest. It is transversely inclined, (see Fig. 5,) the gangue being discharged at its lower edge and the mineral at the tail thereof. The riffles increase in length from the upper edge of the table downward, where they are longest. The lowermost riffle extends nearly the full length of the table.

To the left of the riffle extremities (see Fig. 3) there is a triangular portion A of the table, which is smooth or free from riffles. The function of this smooth or unriffled portion of the table will be hereinafter described.

The table has a longitudinal reciprocating movement and is supported on rollers 7, mounted on a suitable stationary support.

The mechanism for actuating the table will now be described.

The extremity of the table farthest to the left (see Figs. 1 to 4 of the drawings) will for convenience of description in this specification be termed the "head," while the opposite extremity is termed the "tail" of the table.

To the head end of the table is attached a keeper 9, which is engaged by one extremity of a vertical lever 10, fulcrumed at 12 on a support 13, mounted on the stationary frame 14. The upper arm of the lever 10 is slotted (see Fig. 6) to receive a bolt 15, which holds a block 16 in place on the lever. This block carries an antifrictional roller 17, which engages the outer wall of the keeper 9. The block 16 is adjustable for the purpose of changing the bearing-point on the keeper and thereby regulating the length of the table's stroke.

The lower arm of the lever 10 is provided with a bearing 18, which is engaged by one extremity of a link 19. This link is connected at 21 with a link 20, forming a toggle-joint. One extremity of the link 20 engages a bar 22, attached to the stationary frame. The pin 21 connecting the two toggle parts also passes through one extremity of a pitman 23, whose opposite extremity is connected with a wrist 24 on a crank 25, carried by a shaft 26, journaled in an upright support 27, mounted on the stationary frame 14. The shaft 26 is provided with a pulley 28, which may be connected with any suitable motor for operating the mechanism. The outer extremities of the toggle are open, being simply recessed or forked to engage the bearings 18 and 22, respectively. Hence as the shaft 26 is rotated the toggles only impart the backward movement to the table or move it toward the left. (See Fig. 3.) The forward or reverse movement is effected or imparted by the recoil of a spring 29, which is compressed or placed under tension by the table during its backward movement.

In the operation of the machine the material to be treated is discharged in the form of

pulp upon the upper left-hand corner of the table. (See Fig. 3.) The gangue passes transversely downwardly over the angular longitudinal riffles and is discharged over the lower edge of the table, which, as before stated, is transversely inclined.

All the mineral, together with a portion of the gangue, is first caught by the riffles, and under the influence of the table's motion is carried longitudinally toward the foot of the table until it reaches the smoother unriffled portion A of the table, where it is acted on by the water, which effects a perfect or approximately perfect separation of the gangue from the mineral. As the material caught by the uppermost and shortest riffle passes to the portion A of the table the action of the water, which is fed to the upper edge of the tables, carries the gangue downward to the next riffle, while the mineral remains on the smooth portion A and is carried toward the tail of the table, where it is finally discharged. It is expected that some of the mineral caught by the uppermost and shortest riffle will be carried downward with the gangue to the next riffle, which is longer. After leaving this last-named riffle and passing to the smooth or unriffled portion of the table the water again acts on the material and carries the gangue downward to the next riffle, leaving the clean mineral on the smooth portion A of the table. If any mineral escapes with the gangue the second time, it will be caught by the riffle next below and again subjected to the separating action of the water as soon as it reaches the smooth portion A of the table. In this manner the material is carried transversely downward and longitudinally forward, the gangue being discharged at the lower edge of the table completely impoverished of its mineral values, while the latter are discharged at the foot or tail of the table. A portion of the gangue—that is to say, the lighter part thereof—passes over each riffle in succession from the shortest or uppermost to the longest or lowermost riffle. The mineral and the heavier gangue are caught by the riffles and finally separated on the smooth portion A of the table. This combination, in a concentrating-table, of riffles of varying length for catching the mineral and a smooth, plain, or unriffled portion at the extremities of the riffles, where the final separation is effected through the action of the water, is believed to be entirely new in an apparatus of this class.

A riffle is the best means of catching mineral, while a smooth, plain, or unriffled surface is the best for effecting the separation of the mineral from the gangue caught with the mineral by the riffles, the separation being effected by the action of water.

While I prefer to employ the angular riffle shown and described in this application, I do not limit the invention to any special construction of riffle.

The function of the angular riffles will now be described in detail.

The part 8^a of the riffles would be sufficient alone to catch the larger and heavier particles of mineral, but some of the more minute particles would be forced over the riffles and carried downward with the gangue and perhaps finally lost were it not for the part 8^c of the riffles, which checks this tendency and allows specific gravity to prevail, the same as in hand-panning. It is well known that the finest particles of mineral can be saved by hand-panning. The specific gravity of the finest particle of gold is, of course, the same as the largest nugget, and if the proper conditions exist the minute particle can be saved as well as the nugget. The object of my angular riffles is to produce the conditions necessary to save not only the largest but also the finest mineral particles. Under ordinary conditions these fine particles when acted on by a current of water are carried along with the water, and consequently lost with the gangue. The upper part 8^c of my riffle checks the tendency of these light particles to pass over the riffles with the water. Hence they are confined by the bed of the table below the part 8^c of the riffles above, while the part 8 of the riffles checks their downward movement. Hence under the influence of the table's movement or vibration the mineral particles, both fine and coarse, are caught by the riffles.

It will be observed by an inspection of my operating mechanism that the length of the table's stroke may be regulated without changing, altering, or interfering with the quality of the movement imparted by the toggle.

With other toggle movements as applied to this class of machines the length of stroke is regulated by changing the point where the lower extremity of the connecting-rod or pitman is attached to the toggle. This is equivalent to changing the length of the pitman and of course not only changes the length of the table's stroke, but also the quality of the movement. For instance, if the pitman be made shorter the point where the toggle-links are connected must move farther upward, but not so far downward, and vice versa. In other words, by changing the length of the pitman (or changing the point where it is attached to the toggle, which is the same thing) the angle of the links becomes greater when the table has reached its limit of movement in one direction and less when the table has reached its limit of movement in the opposite direction. Hence in such constructions the speed of the table at a given point in its stroke varies as the length of the stroke is changed.

Having thus described my invention, what I claim is—

1. A transversely-inclined concentrating-table having a movement whose tendency is to carry the material longitudinally forward

toward the tail or foot of the table, said table being provided with a number of riffles extending longitudinally a portion of the distance from its head toward its foot, said riffles varying in length for the purpose specified, the table having a smooth, plain, or unriffled portion extending from the extremities of the riffles toward the tail of the table, whereby the material as it leaves the riffles is subjected to the action of the water on the smooth portion of the table and the final separation of the mineral from the gangue effected.

2. A transversely-inclined concentrating-table having a number of longitudinal riffles extending a portion of the table's length from the head toward the foot, said riffles being of unequal length, the uppermost being the shortest while the other riffles increase in length from the upper edge to the lower edge of the table, the table having a plain or unriffled portion lying at the extremities of the riffles and adapted to receive the material caught by the riffles.

3. The combination of a transversely-inclined concentrating-table having a number of longitudinal riffles of unequal length extending from the head toward the tail of the table, said riffles increasing in length from the upper toward the lower edge of the table, said table being provided with a plain or unriffled portion at the extremities of the riffles, and means for imparting to the table a longitudinally-reciprocating movement comprising a toggle, an operating-pitman, and a lever, one link of the toggle engaging one arm of the lever, while the other arm of the lever is connected with the head of the table.

4. The combination of a transversely-inclined concentrating-table having a number of longitudinal riffles extending from the head toward the foot of the table, the table being provided with a plain or unriffled portion located at the extremities of the riffles, and means for imparting to the table a longitudinal reciprocating movement comprising a toggle-joint, an operating-pitman and a lever, one link of the toggle engaging one arm of the lever, while the other arm of the lever is connected with the table and provided with an adjustable roller adapted to engage a keeper carried by the table.

5. The combination of a transversely-inclined concentrating-table having a series of longitudinal riffles extending from the head toward the foot of the table, the table being provided with a plain or unriffled portion extending from the riffle extremities to the foot of the table, and means for imparting to the table a longitudinally-reciprocating movement, said means comprising a toggle-joint, an operating-pitman, and a lever, one link of the toggle engaging one arm of the lever, while the other arm of the lever is connected with the table and provided with an adjustable roller, said roller being mounted on a block adjustably attached to the lever.

6. The combination of a transversely-inclined concentrating-table having a number of longitudinal riffles extending from the head toward the tail of the table, the table being provided with a plain or unriffled portion located at the extremities of the riffles, and means for imparting to the table a longitudinally-reciprocating movement comprising a toggle-joint, an operating-pitman, and a lever, one link of the toggle engaging one arm of the lever, while the other arm of the lever is connected with the table and provided with a vertical slot, and a block held in place by a bolt passing through the slot and carrying an antifrictional roller engaging a keeper on the table.

7. The combination of a transversely-inclined concentrating-table having a series of riffles extending longitudinally from the head toward the tail of the table, said riffles being of unequal length, the uppermost being the shortest and the riffles increasing in length from the upper to the lower edge of the table, the table being provided with a plain or unriffled portion of suitable area located at the extremities of the riffles, means for feeding the material to the upper portion of the table's head, means for discharging water on the upper edge of the table, and suitable means for imparting to the table a longitudinally-reciprocating movement of a character adapted to move the material from the head toward the tail of the table.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR R. WILFLEY.

Witnesses:

ALFRED J. O'BRIEN.

G. J. ROLLANDET.